Pit and Quarry

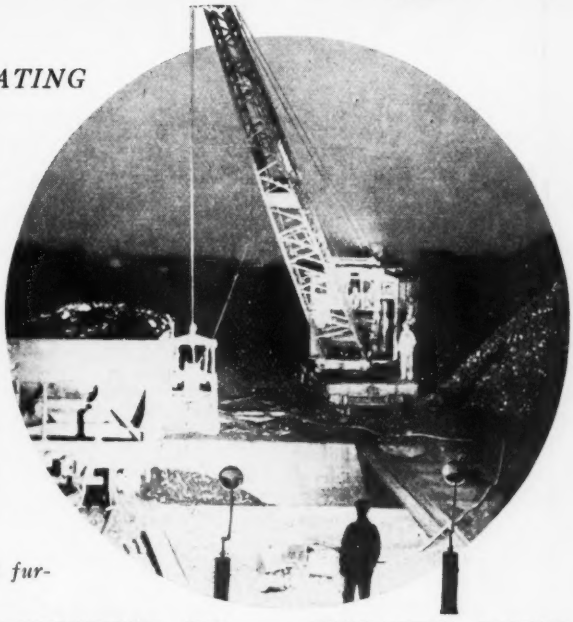
SAND ▪ GRAVEL ▪ STONE

HANDLING ▪ CRUSHING ▪ SCREENING ▪ WASHING

THE Carbic LIGHT

Portable Lights

CLEAR
WHITE
PENETRATING



Whether it is working in the quarry unloading cars, loading trucks, moving stored material in the yards—any kind of work that requires light—you will find that the Carbic light gives better light and more of it than that of any other make.

Each day grows shorter—each night longer—now is the time to try out the Carbic light. It will be placed FREE on your work for trial.

Write for catalogue and further information.

CARBIC MANUFACTURING CO., DULUTH, MINN.

BRANCH OFFICES:

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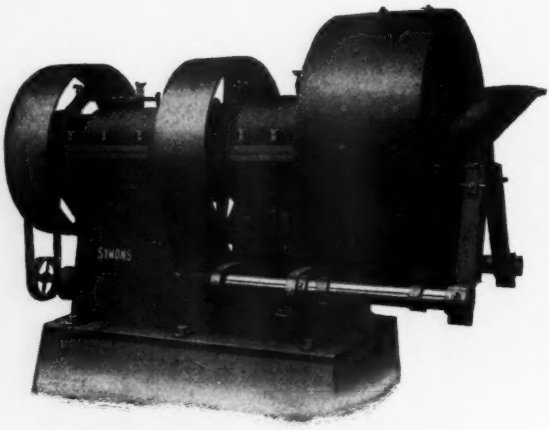
SEPTEMBER 1917

Symons Disc Crusher



THE IDEAL CRUSHER FOR GRAVEL, SAND, ROCK

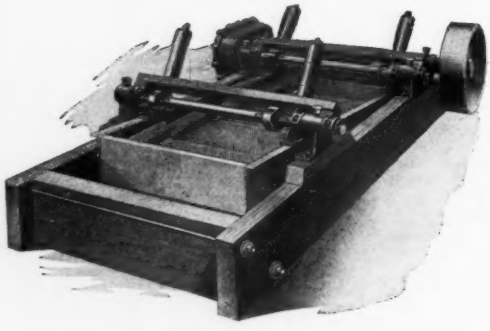
Large Capacity Uniform Size.

In Operation in Nearly Every State

BUILT IN FOLLOWING SIZES.

Size	18	inches	Capacity	5 to 15	Tons Per	Hour
"	24	"	"	12 to 30	" "	"
"	36	"	"	25 to 65	" "	"
"	48	"	"	45 to 120	" "	"

Simons Pulsating Screens



HALF THE COST OF A REVOLVING SCREEN

Larger Capacity
Less Repairs
Less Floor Space

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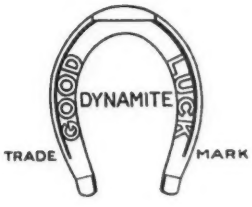
Chicago Heights, Illinois

BURTON
POWDER COMPANY

Manufacturers of

DYNAMITES
PERMISSIBLES
BLACK POWDER



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Probably you have never fully appreciated the immense economical value of

TRADE MARK **Oxweld**

EQUIPMENT to Pit or Quarry Operators

FIND OUT!

Breakage of crushers, hoists, pumps, shovels, washing and screening mechanism may be quickly and inexpensively repaired with the Oxweld Welding Blow Pipe. The illustration above shows a Centre Casting from a Steam Shovel being repaired; its cost to replace would have been $300, its cost to repair with Oxweld equipment was considerably less than one-tenth that amount.

You may benefit by Oxweld efficiency, either through equipping yourself or by taking advantage of our repair stations at Chicago and Newark, N. J., the two largest in the Untied States. We shall be pleased to send you particulars regarding both methods, on request. Ask for Bulletin 508.

OXWELD ACETYLENE COMPANY

NEWARK, N. J. CHICAGO LOS ANGELES

A New Light With Old Friends

For the past ten years quarrymen and contractors the world over have used the Old Milburn Portable Light for powerful outdoor illumination. It met their most exacting requirements. It became their standard.

The NEW Milburn Light is a perfection of the old—built on the experience of ten years of service.

The NEW MILBURN Carbide Light

For Quarrymen and Contractors

cuts lighting costs 50%. Improved design gives absolute automatic operation, continuous or intermittent; impossible to overcharge with carbide; requires no change of water when recharging.

Briefly, it does everything other lights do—with distinctive Milburn improvements.

The New Milburn Light burns ordinary unadulterated lump carbide—any size—free from the foreign substances found in expensive special "cakes." Lump carbide can be purchased anywhere at $4.00 per 100 lb. drum, and yields 485 cubic feet of gas per drum. It means *better light* at *lower cost*.

Let us send a NEW Milburn Light for any test you care to give it. Ask for Bulletin 216.

THE ALEXANDER MILBURN COMPANY
Baltimore, Maryland
Offices or Agents in All Principal Cities

Get Them Together

YOU have one or more blasting experts who know all the special conditions that influence your work. We have competent explosives engineers who have studied blasting problems on hundreds of different operations.

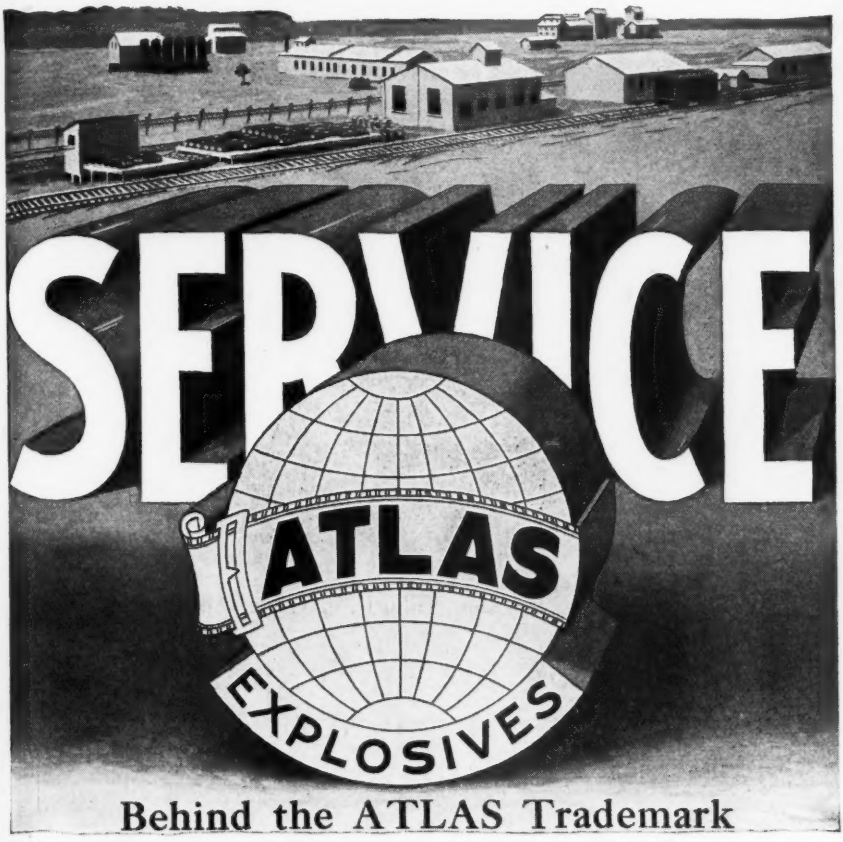
Get them together and these men may be able to work out a way to save money on your explosives.

Many times by adding the special knowledge of the man on the job to the general knowledge of the man who covers the whole field, increased efficiency and economy are obtained.

The unusual conditions of the past few years have demanded radical departures from methods that used to be employed. If you are not sure you have modified your blasting practice to meet new conditions most effectively, we strongly advise you to consult us. Our services are at your disposal. We may be able to save you money if given the opportunity.

HERCULES POWDER CO.
Wilmington Delaware

HERCULES EXPLOSIVES



Behind the ATLAS Trademark

ATLAS service stands pre-eminent. And behind this super-service stands the ATLAS organization of experts bending every energy to make *your* blasting more efficient and more economical.

We have the benefit of more than a century of experience in making explosives. This experience is yours for the asking, to help *you* solve your blasting problems. This definite personal service has cut the cost of blasting for so many of our friends that we are confident it will do the same for you, no matter what the nature of the blasting may be or the special conditions that must be met.

There is a proper ATLAS explosive for each individual blasting requirement. Our tests guarantee every pound for quality and uniformity. You can depend on ATLAS always to give absolutely uniform results under similar conditions.

Your blasting requirements cannot be too large or too small for you to profit by ATLAS service. Just put your problems up to us and we will point the way to better and cheaper blasting.

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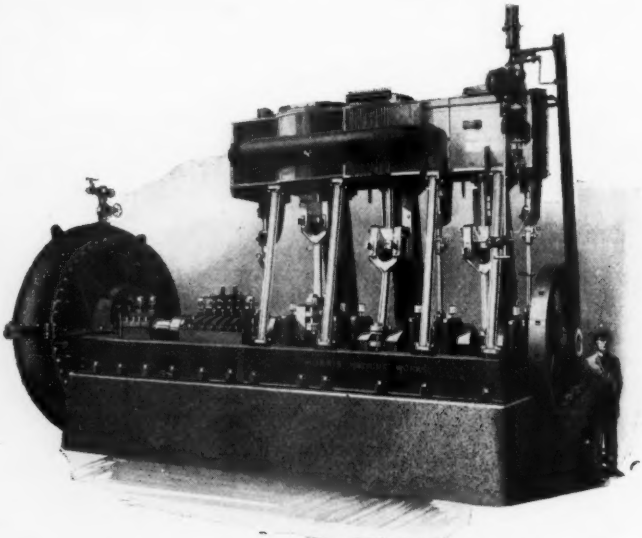
Sales Offices: Allentown (Pa.), Birmingham (Ala.), Boston, Chicago, Houghton (Mich.), Joplin (Mo.), Kansas City, Knoxville, McAlester (Okla.), Nashville, New Orleans, New York, Philadelphia, Pittsburg (Kan.), Pittsburgh (Pa.), Pottsville (Pa.), St. Louis, Wilkes-Barre (Pa.).

A PROPER EXPLOSIVE FOR EVERY BLASTING REQUIREMENT

Put your blasting problems up to us

Our Service Department is a clearing-house of blasting experience in all its phases and under all conditions. It is directed by experts who will personally help you apply this vast store of information to your own blasting. WRITE TODAY.



20″ Dredging Pump, Dir. Con., 1000 H. P. Triple Exp. Engine.

Perhaps your present requirements do not require a pump of this size. Eventually they may.

MORRIS PUMPS

are built in ALL SIZES, therefore your size can be furnished

Have you our catalog? It is brim full of data on sand and gravel pumps. *Yours for the asking.*

MORRIS MACHINE WORKS

Baldwinsville, N. Y., U. S. A.

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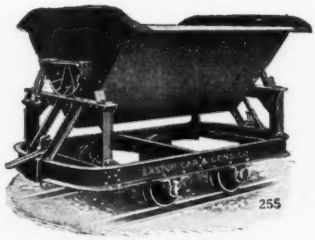
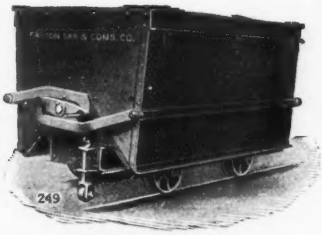


Rocker Dump



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For Pit and Quarry Service

TURNTABLES, Tracks, Ties, Switches and other Accessories are also included in the comprehensive EASTON LINE of industrial Railway Cars and Equipment. We build and carry in stock all standard types of Industrial Cars and also construct special cars for any service from the designs of either your engineers or our own.

Call upon our engineering department for any assistance or data. It will be given freely, promptly and gladly. Twenty-five years' manufacturing and installation experience is at your command.

Tell us the kind of work for which you need cars and we will send Illustrated Specifications describing suitable types

EASTON CAR & CONSTRUCTION CO.

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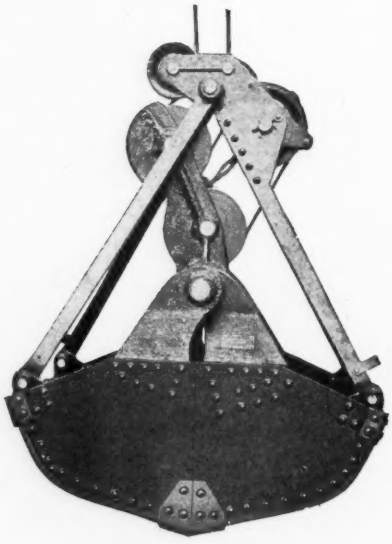
Long Life and Efficient Service are Characteristics of the

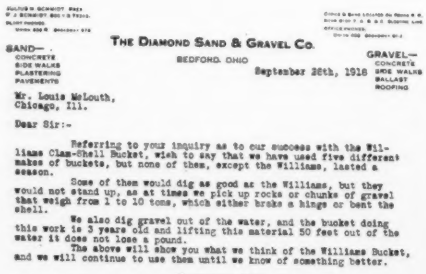
WILLIAMS BUCKETS

because they are built of steel on designs which embody the right mechanical principle.

Simple in construction; bearings, few and extra large; all sheaves bronze bushed; cables perfectly guarded; alignment of sheaves exact at all times; scoops heavily reinforced and so constructed that there is absolutely no side movement; powerful and speedy closing arrangements.

— These are a few of the features that help to make our repair part business so small.





THE DIAMOND SAND & GRAVEL CO.
BEDFORD, OHIO

SAND— CONCRETE, SIDE WALKS, PLASTERING, PAVEMENTS

GRAVEL— CONCRETE, SIDE WALKS, BALLAST, ROOFING

September 26th, 1916

Mr. Louis McLouth,
Chicago, Ill.

Dear Sir:-

Referring to your inquiry as to our success with the Williams Clam-Shell Bucket, wish to say that we have used five different makes of buckets, but none of them, except the Williams, lasted a season.

Some of them would dig as good as the Williams, but they would not stand up, as at times we pick up rocks or chunks of gravel that weigh from 1 to 10 tons, which either broke a hinge or bent the shell.

We also dig gravel out of the water, and the bucket doing this work is 3 years old and lifting this material 50 feet out of the water it does not lose a pound.

The above will show you what we think of the Williams Bucket, and we will continue to use them until we know of something better.

Yours very truly,

The Diamond Sand & Gravel Co.

Fred J. Schmidt

Built in Types and Sizes for Every Purpose

Catalog by Return Mail on Request

THE G. H. WILLIAMS CO.

General Office and Works, ERIE, PA.

GRIT

in your material which cuts the main bearings of the usual type of grab never touches the bearings of the latest type

Owen Buckets

The "Owen" method of protection and lubrication of the main bearings keeps them clean at all times. An exclusive feature which alone insures a longer life of useful service with less repairs than is possible with any other construction.

Ask for pamphlet on Type "L" Bucket Write today

The Owen Bucket Co.

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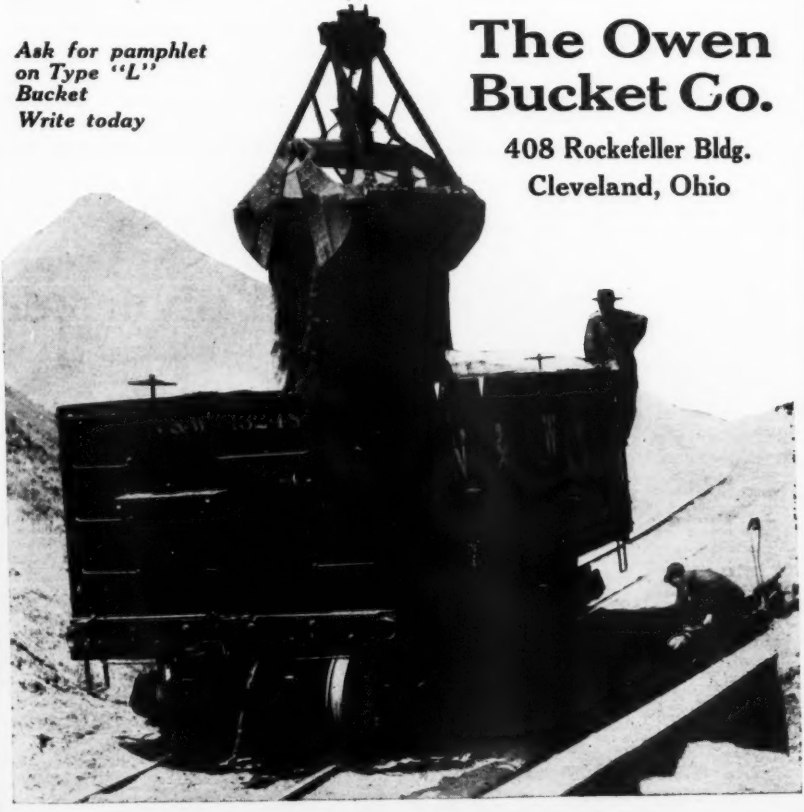
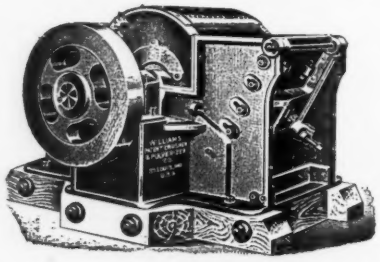
Cleveland, Ohio



FROM 14" TO 18" CUBES TO 1½"- 1"- ¾"- ½" IN ONE OPERATION



BY using Williams Jumbo Crushers to take the feed from the very large Gyratory Crushers, the smaller or intermediate crushers, which were formerly necessary, can be eliminated as the Williams Jumbo Crusher will reduce these large cubes ranging in size from 14" to 18" to a product either 1½"-1"-¾" or ½". Capacities from 60 tons per hour to 200 and 300 tons per hour. Complete description of this extraordinary crusher is given in

BULLETIN NO. 85

THE WILLIAMS PAT. CRUSHER & PULVERIZER CO.

Gen'l Sales Dept., Old Colony Bldg.,

CHICAGO

Save 50% Maintenance Cost

BY USING THE

Brainard Crusher Pulverizer

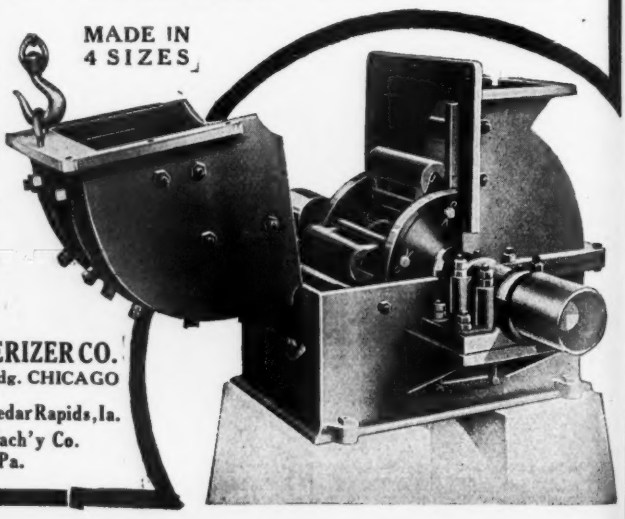
Its durability and correct principle of construction makes the Brainard more economical to operate than others.

It does the work of a crusher as well as a pulverizer, thus saving the cost of one machine.

Eliminates screen troubles. All working parts are easily accessible.

Our Engineering Department is at your service. Write them to day.

MADE IN 4 SIZES



BRAINARD PULVERIZER CO.

330-335 Old Colony Bldg. CHICAGO

Universal Crusher Co., Cedar Rapids, Ia.

Geo. C. Videtto Mach'y Co.
Pittsburgh, Pa.

TRAYLOR
GYRATORY CRUSHERS

Combine more Good Features than any other Gyratory built

An extra large Eccentric, greater in diameter and longer than others.

A shaft 25% larger in diameter than others.

A perfect all-steel suspension at the point of least motion, giving a perfect rolling motion to the shaft.

Lubricating system that forces all dirt from the eccentric cavity, assures a cool running and long lived eccentric.

These and many other points of superiority assure you of the

MAXIMUM OUTPUT

Bulletin G-3 will interest you. Send for it.

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Main Office and Works:

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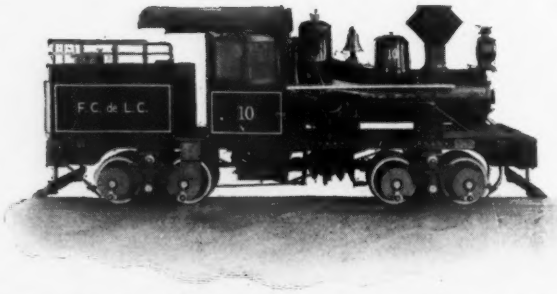
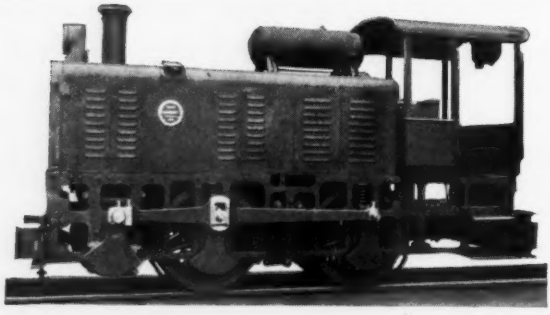
Heisler Geared Locomotives



Do you realize what the Heisler Geared Locomotive can do with its all steel, flexible swivel trucks and center shaft drive; short rigid wheel base, load equally distributed on all wheels; all wheel drivers, each driver having eight impulses of engine to each revolution? This means efficient service on uneven tracks, sharp curves, steep grades; saves in track construction and maintenance. Has a record of always being on the track and ready to start a load quickly. Has many decided advantages over the direct connected or gasoline locomotives for pit and quarry operations. It will pay you to investigate this locomotive for your service. Built in all sizes and gauges. Write today for all particulars.

HEISLER LOCOMOTIVE WORKS :: ERIE, PA.



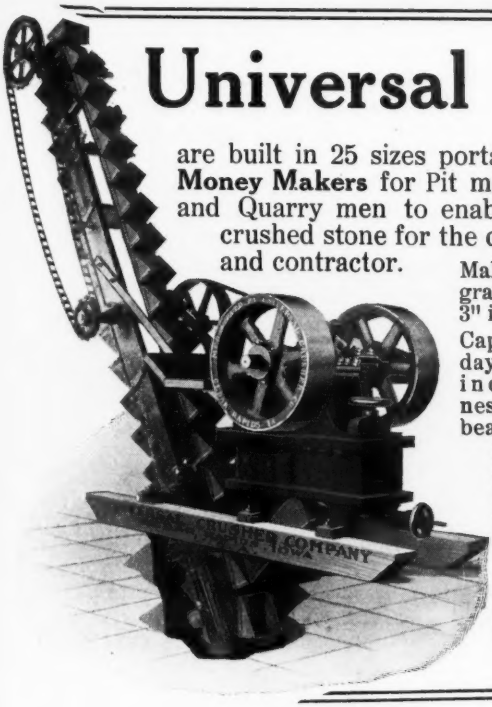
Baldwin Gasoline Locomotives

are suitable for work in quarries, industrial plants and construction service.

Full particulars will be furnished on request

The Baldwin Locomotive Works

Philadelphia, Pa., U. S. A.



Universal Crushers

are built in 25 sizes portable or stationary, and are **Money Makers** for Pit men to crush their oversize and Quarry men to enable them to produce small crushed stone for the concrete man, road builder and contractor.

Makes a product from oversize gravel or Quarry rock from ¼ to 3" in one operation.

Capacities from 5 to 300 tons per day. Jaw openings 5x6 to 14x24 inches equipped with manganese jaws and removable bronze bearings.

Send for Catalogue of full line of Universal and Eureka crushers, rolls for fine grinding, Elevators and screens of all sizes, also full line of Universal Brainard Pulverizers.

UNIVERSAL CRUSHER CO.
200 Third Street, Cedar Rapids
Iowa, U. S. A.

Best For Pits and Quarries

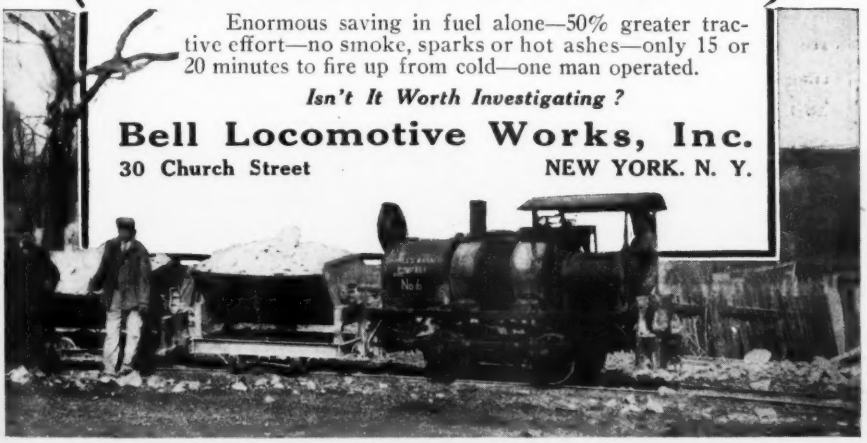
Bell Locomotives are small but powerful, simple to operate, and cost less, both initially and in daily operation. If you want to see your costs *decrease* and your profits *increase,* let us tell you about

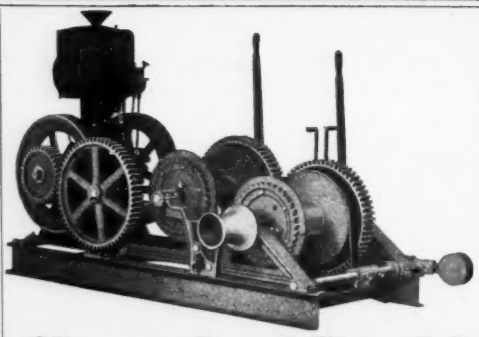
BELL OIL BURNING LOCOMOTIVE

Enormous saving in fuel alone—50% greater tractive effort—no smoke, sparks or hot ashes—only 15 or 20 minutes to fire up from cold—one man operated.

Isn't It Worth Investigating ?

Bell Locomotive Works, Inc.
30 Church Street **NEW YORK. N. Y.**





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in the most economical way is accomplished with the light weight self-contained

Cloverleaf Double Drum Hoist

GASOLINE or ELECTRIC POWER

Outfit operated with 2 men will easily save from 5 to 6 teams and drivers. Saves you moving your heavy excavating machinery, when they ought to be digging products.

Operation Expense at Minimum ***Write for Catalogue***

CLOVERLEAF MACHINE CO.

SOUTH BEND **INDIANA**

Getting More Out of Your Equipment

It's the time you save—the up-keep expense you eliminate—the *Service* you get that counts.

Made Either Right or Left Hand

Sizes:
5 H. P.
7 H. P.
10 H. P.
and
15 H. P.

DAKE Swinging Gears

are built for service and pay for themselves by speeding up the work of any bull wheel derrick. The reversible engine, with no dead centers, and simple, single-lever control makes quick, accurate spotting of the load possible.

Write us for particulars, and ask any user.

Dake Engine Co., Grand Haven, Mich., U. S. A

INDEX TO ADVERTISERS

American Pulverizer Co. 55
Atlas Powder Co. 7
Austin Mfg. Co. 50
Baldwin Locomotive Works. 14
Ball Engine Co. 18
Bell Locomotive Works. 15
Blaw Steel Cont. Co. 44
Brainard Pulverizer Co. 12
Burton Powder Co. 3
Caldwell & Son Co., H. W. 42
Carbic Mfg. Co. 1
Cement Tile Machy. Co. 50
Clapp, Norstrom & Riley. 61
Cleveland Wire Cloth & Mfg. Co. 54
Cloverleaf Machine Co. 16
Charter Gas Engine Co. 17
Chicago Perforating Co. 54
Chalmers & Williams. 2
Cincinnati Frog & Switch Co. 18
Dake Engine Co. 16
Daum, A. F. 59
Donahue & Co. 54
Duplex Truck Co. 62
Easton Car & Const. Co. 9
Empire Engineering Co., Inc. 58
Erie Pump & Engine Works. 50
Fate Co., J. D. 46
Githens, Geo. S. 54
Heisler Locomotive Works. 14
Hendrick Mfg. Co. 53
Hercules Powder Co. 6
Jeffrey Mfg. Co. 64
Machinery Warehouse & Sales Co. 60
Marsh-Bothe Machy. Co. 59
Milburn Co., Alexander. 5
Morris Machine Works. 8
Nortmann-Duffke Fdry. Co. 53
Owen Bucket Co. 11
Oxweld Acetylene Co. 4
Ridgeway, J. A. 47
Sauerman Bros. 55
Sellar Supply Co. 56
Stephens-Adamson Mfg. Co. 10
Standard Motor Truck Co. 63
Superior Iron Works. 49
Torbert, A. C. 61
Traylor Engineering & Mfg. Co. 13
Universal Crusher Co. 15
Victor-Balata & Textile Belting Co. 49
Whayne Supply Co., R. C. 58
Williams Co., G. H. 10
Williams Patent Crusher & Pulv. Co. 12

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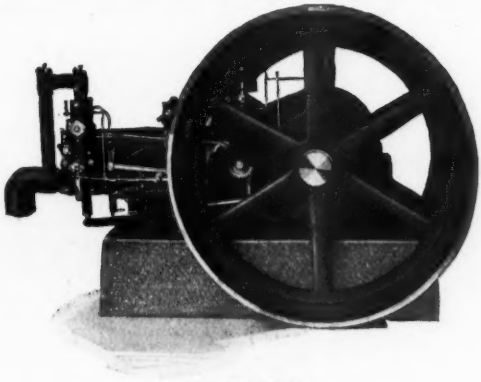
Will pump your water, wash your sand and gravel, crush your rock and stone, at less cost than you can possibly do it for by using steam or electricity

The Logical Power for Isolated Plants



Operate on Low Priced Fuels

8 to 160 H. P.

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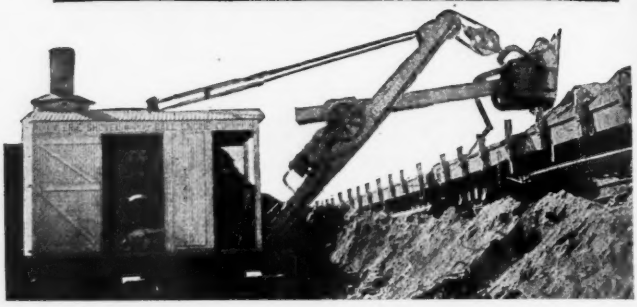
CHARTER GAS ENGINE COMPANY

10-96 FIRST AVENUE **STERLING, ILLINOIS**

Erie Revolving Shovels

"This shovel has done remarkably well!"



"We loaded on cars 25,168 tons in 30 working days—most of the time without enough cars.

"One man handles our Erie; we use a fireman only when working to capacity. No pitmen. We have platforms for moving up the shovel, and it takes only about four minutes. We are boosters for the Erie!"—Champion Sand & Gravel Co., Marquette, Mich.

Every Erie owner is an Erie booster—because the Erie has broken all output records for ¾ yd. shovels. And it is built *stronger*. It's *reliable*.

So instead of telling you to buy an Erie, all we say is: "Find out which is the best revolving shovel on the market."

Write for the addresses of Erie owners near you—and we would like to send you a copy of our new Bulletin "Q."

Ball Engine Co., Erie, Pa.

We're Ready

to meet your requirements in full for high grade

Track Equipment

A complete line of frogs, switches, crossings, crossovers, switch stands, etc.

Ask for Catalog 103

THE CINCINNATI FROG & SWITCH COMPANY

MANUFACTURERS OF TRACK EQUIPMENT FOR STEAM AND ELECTRIC RAILROADS MINES AND MILLS

CINCINNATI, O.

Pit and Quarry

Vol. I **SEPTEMBER, 1917** **No. 6**

A Bi-Monthly Journal for Producers and Marketers of Sand, Gravel and Stone.

Subscription Price $1.00 *Per Year.*

Address Pit and Quarry, 527 S. La Salle St., Chicago. Tel. Harrison 6729.

Going After Business.

The Waukesha Stone and Lime Co. have the right idea. Turning out a high grade of agricultural lime and limestone, they have prepared a 34 page book for the farmers on whose acres the materials should be used. They have also established a soils department through which information is given relative to improving soil conditions. Most farmers are glad to receive this kind of service, as it means increased crops and soil fertility. Farming is a science now, and the farmer usually improves every opportunity such as this to learn how he can improve his property.

Have a Side Issue.

While visiting a cement products plant recently we were impressed with the idea that there was a chance for many sand and gravel men to engage in the same business. These plants require sand, gravel and stone, and while there is a profit in selling the raw materials, why not get the profits on the finished articles, too.

We are all familiar with the watch spring argument. We send pig iron to Switzerland at $40 or $50 a ton and buy it back in hair springs at some millions per ton. The difference goes for labor in another country. Now, why not apply the same principle to your business. Make the concrete drain tile, the concrete blocks, fence posts, burial vaults and even caskets. There is money in these things and the man with the sand pit has the principal ingredient. When the product leaves his place it should be finished.

We observed that nearly every cement products company had their own sand and gravel pits, but they were not always as well managed and operated as they should be. That is because they made a side issue of the sand and gravel business. Some of them sold considerable quantities of sand and gravel, too, showing that they appreciate that end of the business as well as the manufacturing.

Chains and Belts.

There is a striking difference in the two types of bucket elevators now being used in quarry and gravel plants. The old type of buckets on chains have been replaced in some plants by an elevator of buckets on a belt. The editors of this journal in visiting plants in various sections of the country see these different installations and inquire as to the merits of each, from both manufacturers and users.

Naturally the manufacturers of chains only state that theirs gives the better service, while belt manufacturers favor the use of belts over chains. A few manufacturers who furnish both chains and belts are noncommittal, saying they sell the customers the style they desire.

Many users have only tried the

chains and naturally swear by them. Those who are using belts are seldom willing to express a decided opinion in favor of either. Both types of elevators have been in use long enough to have some exact data as to each, both as to efficiency and cost over a period of several years. The readers of Pit and Quarry would like to know of the merits of both. It would be interesting to hear from the users of elevators and also the manufacturers. We gladly open our columns to those who have any data of value that they wish to present to our readers. Opinions are of little value, but cold facts as to the efficiency and economy are.

Quality Counts.

It pays to be able to prove your product is equal to the best. Clean sand and gravel, well graded, will always command attention for high class work, and that is the only kind that pays anyway. There is a growing tendency to be more particular, and as engineers and architects will continue to direct most big jobs, it will pay to boast of the quality of your product.

Fred G. Pulley Joins Pit and Quarry Staff.

Beginning with this issue, we announce the addition of Fred G. Pulley to the editorial staff in the capacity of associate editor. This arrangement is in furtherance of our policy of gathering and distributing helpful news and information by men who have given thorough and intensive study to the needs, conditions and progress of the building material industry, and who from their observations and experience are best equipped to search out and relate that which is of the most practical benefit.

Mr. Pulley in seven years has become known to thousands whom he has met in office, field and convention hall; and because of his profound interest in the production of sand gravel, stone and other building materials, he has become close not only to the industry, but to the men on it. Each sand and gravel or stone deposit has its peculiar topographical and marketing conditions, and Mr. Pulley has particularly noted the methods used to meet mining difficulties, transportation and other problems. For several years he was associate editor of Rock Products, and later with The Contractor in the same capacity.

The Chicago Cement Machinery and Building Equipment Show.

Pit and Quarry readers will be greatly interested in the above named show which will be held at the Coliseum, Chicago, February 6 to 13, 1918. It will be more than merely a Cement Show or Building Show, as it will indicate to our readers how their products are used. Many ideas regarding new markets will occur to the visitors as well as methods of improving the products. Many of the leading machinery manufacturers are planning exhibits and no producer of Sand, Gravel or Crushed Stone can afford to miss the Show.

Quarry of the Petoskey Portland Cement Company.

On the opposite page are two views of the quarry and plant of the Petoskey Portland Cement Company at Petoskey, Michigan. Although the state of Michigan is generally considered to be mostly sand, there is all kinds of rock in the northern part. This limestone ledge is at present furnishing 1,000 tons of rock a day, most of it being used in the manufacture of Portland Cement, although large quantities are used for road and street work as well as for furnace and foundry flux.

The power plant consists of 200 horsepower boilers and a 150 horsepower Reynolds Corliss engine. Load-

Crusher and Power House with Vulcan Shovel at Work

ing is accomplished by two Vulcan shovels, one 70-ton and one 85-ton. The industrial cars are hauled to the crusher by two Davenport locomotives.

The first crushing is done with a No. 8 Austin Gyratory crusher, and the finishing with two No. 5 Austins and one No. 3 Allis-Chalmers. Storage bins for loading direct to cars hold about 600 tons.

Face of the Quarry Showing Level Stratification

General View Showing Height of Pit and Screens

Two Plants of the Richardson Sand Company.

As the merits of concrete become better known the demand for better materials in the form of sand and aggregate is more insistent. When no concrete was used, only sand could be used for mortar and so great deposits of gravel were untouched, and sand alone was considered valuable. Today almost the reverse is true, for while quantities of sand are used, a still larger quantity of gravel is required. This has led to equipment designed to wash and screen both the sand and gravel, and to crush the oversize gravel down to the sizes found best adapted to various classes of work.

The former custom of using bank-run sand and gravel is practically abandoned, especially for work of any engineering pretension, for a suitable density of concrete can be obtained only by careful grading and proportioning. For some work three and even four sizes of sand and gravel are used.

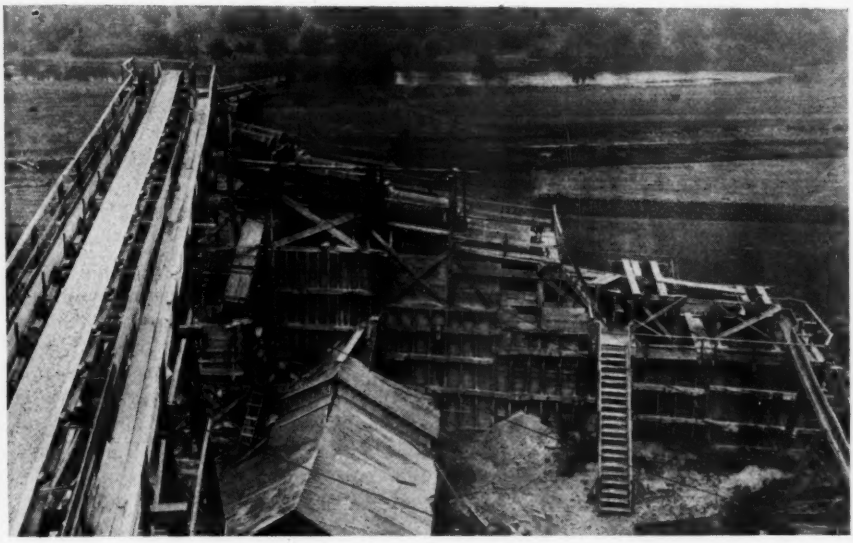
Washing is just as important as grading and crushing; the oversize gravel does more than merely add that much material to the stock piles. The larger stones are usually the hardest and by crushing, the angular faces of the hardest stone adds materially to the strength of the concrete.

Roughly, the densest mixture can be made by using 40 per cent sand and 60 per cent gravel or two of sand and three of gravel. When the sand is in excess of this, more cement is

View Showing Screens and Bins with Cars Loading

necessary, while more gravel means more and larger voids unless again more cement is used to fill the voids.

The search for commercial gravel beds has therefore been largely given to finding deposits in which this ratio was closely approximated. An excess of one material or the other means hunting up a market for the surplus material, and sometimes this is a difficult matter.



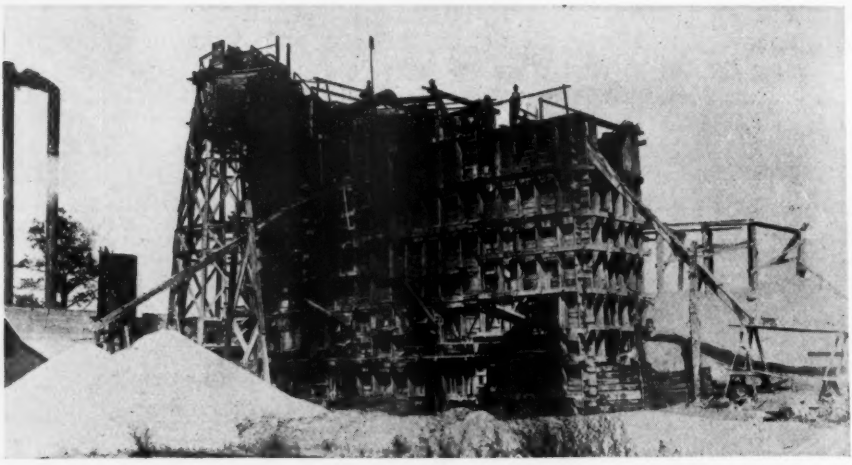
The Rexall Belt Conveying Gravel to the Harrington and King Screens and Dull Settling Tank

One of the most famed districts for sand and gravel lies along both sides of the Fox River, about 35 miles west and north of Chicago. From St. Charles to McHenry, Illinois, there are numerous sand and gravel banks, and the Richardson Sand Company having their main office at 138 West Washington street, Chicago, selected sites near Coleman and Carpentersville for the location of their plants. The illustrations give an excellent idea of the general arrangement of the plants, both of which are furnishing materials for the Chicago market as well as for considerable local trade.

The sand and gravel for the Carpentersville plant are obtained from an immense deposit immediately back of the plant and at present only a portion of the higher level has been excavated. The Baldwin Locomotive and Roger Ballast Dump Car, in Figure 1, are on the level of the bottom of the present excavation, and the track circular in shape, is pushed out as fast as the Marion Steam Shovel, aided by a Byers Auto-Crane, cuts a larger ring around the circumference. In this way switching is reduced to the minimum and the cars are loaded and unloaded rapidly. Two locomotives and three cars keep the plant moving.

Only the largest boulders, seen in Figure 1, are taken out at the hopper below the car. All the remainder of the sand and gravel is carried by a 30-inch Rexall belt to the screens over the bins. This conveyor, designed by the Stephens-Adamson Mfg. Co., is shown in Figures 1 and 3, but is best seen in Figure 2.

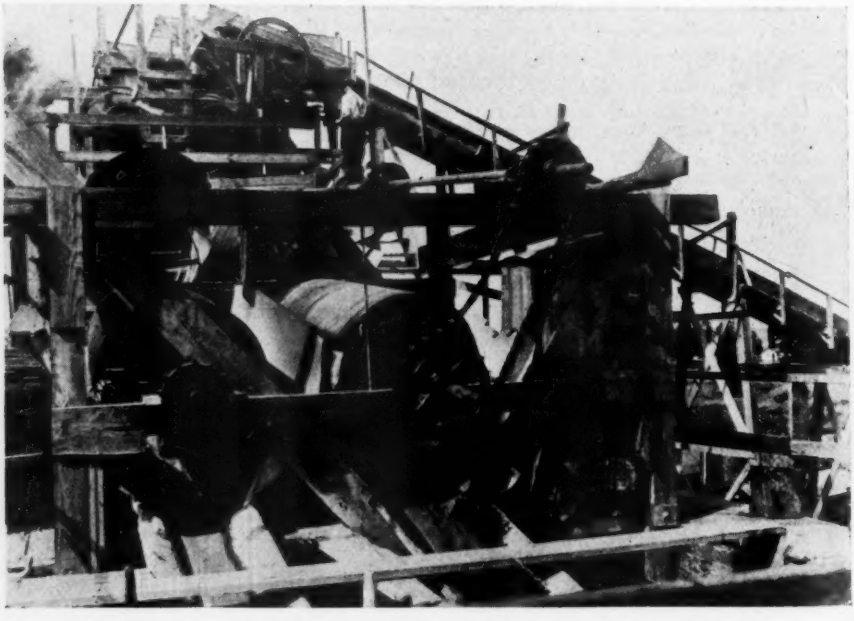
The oversize from the first screen drops through the box chute seen in Figure 2, to two No. 5 Gates Crushers



Screens and Bins of the Plant at Coleman

and a set of rolls. A return belt from the crushers takes the material up to a hopper which also discharges to the main belt. In this way the oversize material passes over the first screen twice and is thoroughly mixed with the finer material. At the same time should it be advisable to handle it separately, that course is possible.

Screening is accomplished with four double sets of cylindrical perforated screens shown best in Figure 2. These screens were furnished by Harrington and King, Chicago Perforating



A Close-Up View of the Screens

Company and Johnson and Chapman. A Dull settling tank is used in connection with the screens.

Practically every commercial size of sand and gravel is made at this plant, but if any size is given preference it is No. 1 Torpedo sand. This is washed and screened twice and it is stated is particularly satisfactory for plastering. The company has a heavy demand for this grade.

Figures 4 and 5 show the plant at Coleman, Illinois, some fifteen miles south of the Carpentersville plant. Practically the same equipment is used in this plant; the difference being only such as experience has shown advisable for the special conditions.

Each of these plants has a capacity of 45 to 50 cars daily, although at the present time the car shortage has seriously interfered with making record runs. As a result there are stock piles to be seen around the plants, but it is to be hoped that these will largely disappear before snow flies.

Good Roads Resolution Boosts Prosperity.

WHEREAS, At a meeting of the Trustees of the Ohio Good Roads Federation in conference with the State Grange, Ohio Automobile Association, State Highway Department, and representatives from the Ohio manufacturers of road materials and machinery, automobiles, trucks and allied industries, county commissioners, county surveyors and contractors the following resolutions were adopted:

RESOLVED: First, that the efficiency of our industrial, commercial and agricultural activities should not be lessened or handicapped by war hysteria.

Second, that our financial resources are in healthy condition; no stringency in the money market exists; there is ample employment at good wages for all labor; that the agricultural districts promise an unusual acreage and harvest yield; that every pound of meat and bushel of grain the farm produces can be sold at profit prices; and that none of the factors that usually contribute to business depression now exist.

Third, that any policy of governmen that retards any useful activity will correspondingly harm other industries.

Fourth, that one great economic need of the farm and farmer is improved highways that will assist in transporting products of farm, field and garden to the market.

Fifth, that freight congestion in great centers of traffic creates imperative need for good highways to supplement railroads in transporting the product of the industrial and commercial world.

Sixth, that the war in Europe has already demonstrated that good roads are powerful adjuncts in national defense in the movement of armies, war munitions and all military supplies.

Seventh, that good roads are important factors in rural welfare, contentment and vitalizing of rural America, therefore,

BE IT RESOLVED, That this conference urge the national and state administrations, state highway department, county commissioners, county surveyors, township trustees and municipal councils to adopt and go forward with a vigorous, progressive road building program.

We commend all county commissioners and road builders who have gone forward in road building and are doing their utmost to place Ohio in the lead in the nation in the improvement of its highways.

General Methods of Working Pits.

(Tells of two methods of working the sand pit, with a word on the design of plants.)

D. J. HAUER.

In the July issue of Pit and Quarry there was a short discussion on this subject, pointing out the two general methods of working a pit to a breast and excavating from on top.

In deciding upon the method to be used, in addition to the lay of the pit and the local conditions, consideration must also be given to the washing, screening and loading plant. It may be that the plant is made lower than the grade of the bottom of the pit, when it is evident that to work against a breast, so that cars can be loaded and carried to the plant and the material passed through the washer, screens and loading pockets by gravity will be economical. This means to save money, but if the material has to be elevated to some height then it may be more economical to excavate the pit from the top, as some kind of elevating machinery must be installed and the excavating machinery may at the same time do the elevating as in the case of a slack cableway or a grab bucket on a derrick.

This makes each pit a proposition into itself and every man operating a pit must make a study of his local conditions and the lay of the ground and decide accordingly.

There are times, though, that both of these general methods are applicable to the same pit and can be used with but slight variation with the same screening and loading plant.

This would be the case when the gravel or sand or both is of great depth, the upper part standing in a bank, while the lower may be below the water level. In a case like this, the screening and loading plant can be installed at the most suitable place, and a steam shovel in the cars used to excavate the bank against a breast. This method can be used down to the water line or just above the water line to avoid pumping, and continued until a large area is excavated. Then while the shovel is working over a new part of the pit, excavation can be started on the old area by means of a slack line cableway.

To do this the screening and loading plant does not have to be changed, it needs only to be large enough to take the capacity of the two types of excavators. This shows the need of always designing a plant for extra capacity. To put up a small plant and then keep adding to it means a duplication at extra cost and an unsatisfactory plant to operate, seldom proving economical or efficient. In designing the plant it should be for a large capacity even if the entire plant is not built at first, only a single unit, but the design being correct, additions can be made as the business grows, giving an up-to-date plant at all times and not a makeshift.

Thus as the slack cableway is installed all that is necessary is to put in this unit and from the tower of the cableway, placed near the plant, a chute is used to carry the materials to the screens, not interfering with the material that is brought from the steam shovel.

This gives two excavating plants carrying material to a central screening and loading plant, and allows of both methods of excavation in the same pit. In this manner all pumping in the pit is eliminated as the steam shovel excavates in the dry bank, while the slack cableway is used below the water line. This is already being done in some pits in this country.

Standard Sizes of Stone and Gravel for Use of Wisconsin Highway Commission.

Standard sizes of stone and gravel for use in all state and state-aid construction have been adopted by the Wisconsin Highway Commission. This standardization is the result of conferences between the Commission, the Crushed Stone Producers' Association, the Wisconsin Society of Engineers and the State Chief Engineer. The members of the Crushed Stone Producers' Association have agreed that as they renew their screens they will install screens so that they can furnish materials complying with these standards. The State Highway Commission points out to both stone and gravel producers that it believes that this standardization, reducing as it does the number of screen sizes in many cases, should enable them to put in longer screen lengths for each standard size and thus secure a better separation of the materials, especially in the small sizes.

The state standard sizes and numbers are as follows.

No. 1. Material retained on a 2-in. circular opening and passing a circular opening not greater than 3½ in. in diameter.

Note: Plants may furnish as No. 1 material the product retained on a 2-in. circular screen and passing a circular screen 3½ in. or less in diameter.

No. 2. Material retained on a 1-in. circular opening and passing a 2-in. circular opening.

No. 3. Material retained on a ½-in. circular opening and passing a 1-in. circular opening.

No. 3½. Material retained on a ¼-in. circular opening and passing a ½-in. circular opening.

No. 4. All material passing a ¼-in. circular opening.

In the future state specifications from commercial plants will call for No. 1 stone for first course of macadam; No. 2 stone for the second course of macadam, and No. 4 for screenings. Nos. 3 and 3½ will not be used in new macadam construction except that possibly No. 3½ may be used for preliminary screening in certain cases.

For 1-course concrete roads, state specifications will call for material retained on a ¼-in. screen and passing a 2-in. screen, with no intermediate size removed, being a combination of all materials included in Nos. 2, 3 and 3½.

Note: A passing screen smaller than 2 in. may be used for gravel, quartzite, granite and trap rock aggregate, provided it is not less than 1¼ in.

For 2-course concrete work the state specifications will call for first course, coarse aggregate the same as for 1-course concrete. The second course, coarse aggregate will consist of material retained on a ¼-in. screen and passing a 1-in. screen, with no intermediate size removed, being a combination of Nos. 3 and 3½.

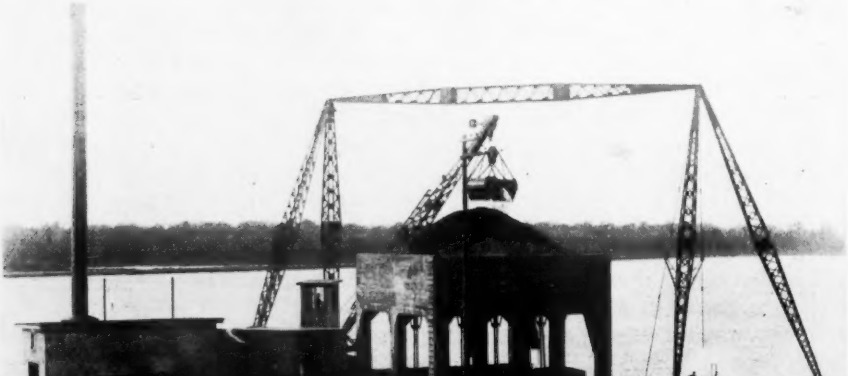
For use in absorbing surface treatments on macadam roads for first application No. 3½ is recommended; for further applications either No. 3 or a combination of No. 3 and No. 3½. Do not use No. 4, which contains fine sand or dust for absorbing purposes.

The state standard for sand will be all material passing a ¼-in. screen, provided that not more than 20 per cent shall pass a sieve having 50 meshes per linear inch, and not more than 5 per cent shall pass a sieve having 100 meshes per linear inch.

It will be noted that the five sizes specified will ordinarily be separated in the process of production, but that it is possible, by remixing these sizes, to produce materials meeting a large number of specifications, and the range of sizes thus secured is believed to be adequate for all architectural and engineering purposes.

The Mississippi Sand Co. Plant at Alton, Ill.

Access to unlimited quantities of sand in the bed of the Mississippi river near Alton, Illinois, led to the building of a reinforced concrete sand bin as shown. A centrifugal pump on a steamboat pumps the sand from the bottom of the river, discharging into a barge. This is towed to the dock and the sand lifted to the bins by a 2½-yard clamshell bucket. Twelve gates in the bottom of the bin allow rapid loading of cars underneath, while wagons or trucks may be loaded by chutes on the sides of the bin.



Sand Handling Plant and Reinforced Concrete Bin

The sand bin is 36 feet 6 inches square and 30 feet above the railroad tracks, having a clearance for cars of 17 feet 6 inches. The foundation is a mat of concrete designed as an inverted flat slab, 41 feet square and 20 inches thick. This rests on an old fill consisting of earth and limestone spalls from an old quarry.

Nine columns each 2 feet 4 inches square support the bin, which consists of a flat 18-inch floor slab with walls 9 feet high. The columns and bin are heavily reinforced.

The pier supporting the 10-ton derrick is 40 feet high, built up from bed rock. It is 16 feet square at the top and is tied to the base of the bin by two reinforced concrete struts, placed on angles of 45 degrees to counteract the overturning moment.

The all-steel, special, stiff-leg derrick is mounted upon this concrete pier. The derrick has a 53-ft. mast and 75-ft. boom. One of the stiff legs is of regular construction, going down to an anchorage at about 45-degree angle, but the other stiff leg is of the "A" frame type set back beyond the track, close to the concrete bins, and connected to the mast by a structural steel top strut 74 feet long. The bucket is a 2½ cu. yd. capacity Class G Hayward clam-shell of the rope-reeved type, bottom, tapering to 9 feet square at the weighing empty about 5,500 lbs. The clam-shell is suspended so as to open crosswise of the boom, and thereby reaches the sand on the deck of the barge to the best advantage. The boom-end sheaves in the derrick are 36 inches diameter, and all sheaves are of specially large diameter to give long service to the wire rope.

The main bucket engine is a special Lidgerwood No. 234 double tandem friction drum engine without link motion but of very heavy design. It has double 12x12-in. cylinders. The two tandem friction drums are 36 inches diameter by 39 inches face and each drum winds a 1-inch diameter cable. The brakes are lined with non-burn material and the drumshafts, the gearing, and all parts of the engine are particularly heavy and designed for severe use.

The derrick has a 14-ft diameter steel bull-wheel and the swinging is done by a Lidgerwood special No. 155 single reversible link motion, compound geared swinging engine, with double 6¼x8-inch cylinders and a single drum 20-inch diameter, the engine being geared for power in the ratio of about 20 to 1. These two engines for operating the derrick are placed back on the concrete slab a considerable distance from the foot of the derrick and both engines are operated by an arrangement of friction, foot brake, and swinging levers assembled in a quadrant stand, which is located forward of the engines on a platform of about 8 feet above the engine floor line, so as to give the operator a very clear view of the entire work.

Besides the bin and derrick, the plant includes a boiler house and superintendent's office. These are of frame covered with metal lath and Portland cement stucco.

The sand bin was designed by Brussel and Vitirbo of St. Louis, while the derrick, pier and engine foundations were designed by Morey Newgard and Company of Chicago.

Atlas Portland cement was used for all the concrete, and we are indebted to the Atlas Portland Cement Company for the photograph of the plant.

The future of the Mississippi Sand Company has been made very uncertain by the war. President H. B. Mathews, Jr., who is among those drafted, stated that he does not know what is to become of the company if he is called to the colors.

Joe Aldeus, assistant manager of the company, has been called to the training camp at Fort Sheridan; Ed Kniery and Dudley Rintoul, the two other managers of the departments of the big sand and rock plant, have been called in the draft. If Mathews is called away no one in authority will be left in the plant.

Percentage of Sand and Gravel

It is frequently necessary to know what percentage of the bank-run is sand and what gravel, or perhaps one may call it fine and coarse aggregate.

It depends somewhat on the purpose of the materials. For concrete everything that passes a ¼-inch mesh is called sand or fine aggregate, anything coarser is coarse aggregate. To find the percentages weigh out 100 pounds of the gravel just as it comes from the bank. Screen out the sand and weigh it. That gives the percentage of sand of fine aggregate. Pick out the boulders too large to use for concrete and weigh the rest of the gravel. That gives you the percentage of usable gravel. The boulders are waste unless they are to be crushed, in which case it should be done before screening.

$120,000,000 in Trucks.

Duplex trucks to the value of $12,000,000 will be manufactured next year, according to the new sales manager, Mr. Andrew Langenlacher, of the Duplex Truck Co. Dealers are being allotted territory so that the requirements of everyone will be promptly met. The demand for Duplex trucks has necessitated many new buildings at the Duplex plant at Lansing, Michigan, and it is necessary to run at full capacity to keep pace with the orders received.

Cost Keeping for Quarries.

D. J. HAUER.

(Outlining the general system of keeping costs in all kinds of quarries, and showing the need of such records to earn the greatest possible profit. Cost keeping leads to efficient management.)

The first step toward systematizing the work in any kind of a quarry is the installation of the proper methods of cost keeping and bookkeeping. This may not be absolutely essential in order to make a profit, for many quarries are operated at a profit without any attempt at cost keeping and but little bookkeeping, but it is essential to have a good system of both if the greatest possible profit is to be made.

Due to a lack of such systems in many quarries there are leaks and wastes that are quite startling when they are discovered, and once eliminated they mean thousands of dollars of extra profit in the course of a few years.

In order to install a cost keeping system (bookkeeping will be discussed in future articles), there must first be a division of general headings of the costs, then these will be divided into subheadings, so that each can be considered in detail. Under the subheadings it will also be possible to take up for discussion general methods of carrying on each operation of quarrying, in other articles.

Costs in quarrying can be divided under three headings:

1. Development.
2. Operation.
3. Overhead.

It would see that the first and third heading could be included under one of "overhead," but there must be a separation as the development includes the costs that may be heavy during one year and light another, or for only a part of a year, while under overhead will come those charges that are constant, such as superintendence, selling and other costs that can not be thrown in either with the development or the actual operation of the quarry.

Both the first and third headings are difficult to keep and are more difficut to apply to the daily operating costs, but as these items run into much money it is necessary to keep them with great care and to arrange the cost keeping system that they can be applied upon a unit basis for each day's output.

These units of measurement must be understood before any definite system can be devised. The most common unit is that of the ton, but others are used, as the perch, the cubic yard, the square foot, lineal foot, cubic foot, block and others, depending for what purpose the quarry product is to be used. These units of measurement will be taken up in the proper place.

DEVELOPMENT COSTS.

The development of a quarry comes not only when it is first opened up, but continually during the term of years that the quarry is being operated. It is an expense that is hard to standardize. In opening some quarries it is so large that it really becomes a capital item. Some part of it, as the plant, the original installation and new plants added from time to time are capital expenditures and must be so treated, nevertheless this item must be included in with the daily costs, otherwise the quarry may be so operated, as the writer knows of a case, so that this capital is eaten up and the operation becomes bankrupt.

The various subheadings under the cost of development can be listed as follows:

1. Stripping.
2. Quarry Arrangement and Improvements.
3. Pumping.
4. Quarry Plant.
5. Production Plant.

These vary exceedingly in different quarries of the same class, that is producing the same products, and the variation is much greater in quarries that produce different products. For instance the production plant for a quarry producing large dimension stone only, may be small, while for a quarry producing marble for interiors of buildings may have a production plant costing thousands of dollars. Likewise a crushed stone quarry may have little stripping and nominally no rotten rock that must be disposed of, while another quarry producing crushed stone may have a heavy overburden and ten or fifteen feet of rock on top of the ledge that cannot be used for crushing, but must be disposed of in the stripping, yet even with this extra expense the quarry may be a profitable one.

Likewise in pit quarries the pumping may be a large item of cost, while in high ledges there may not be the expense of pumping. This item of pumping is a serious one to handle, but it will be discussed under its subheading. It would seem logical to include it under the cost of operation, but it is hardly practical to do so in most quarries.

OPERATION COSTS.

These are the daily costs, although some few may not occur each day, but come a few times a week. The various subheadings must be further broken up according to the classes of products being produced. The following lists give the general subheads:

1. Loosening.
2. Loading and Breaking.
3. Culling.
4. Transporting to Plant.
5. Producing.
6. Handling and Storing.
7. Loading.
8. Power.

Most of these costs are those usually kept in a quarry and are more generally understood than those under the other headings, but some of them are at times ignored, so that wastes occur that the quarryman thinks little of, yet it means that a profit is slipping from him.

OVERHEAD COSTS.

A statement issued by the Federal Trade Commission about a year ago told that 30,000 companies doing an annual business of more than $100,000 did not charge in their cost accounting most of their overhead costs. This alone shows how slow manufacturers have been to adopt modern accounting methods. Many quarrymen are just as lax, for this season a quarryman stated to the writer that he had no accurate record of any of his costs and especially his overhead.

Some of the following list are too frequently overlooked:

1. Superintendence.
2. Office Expense.
3. Insurance and Compensation.
4. Selling.
5. Taxes.
6. Land Values.
7. Royalty.

These are not such costs as can be estimated daily, but are rather bookkeeping charges, but if the proper system is used it is possible to make daily charges in the cost keeping system, so as to cover all of these overhead expenses, and this should be done in every quarry operation.

(Note: This is the first of a series of articles on the important subject of cost keeping for quarries. The second will appear in the September issue.)

Mr. Chester H. Lehman, for the past six years Secretary and Director of the Blaw-Knox Company, has entered the service of the United States Government as First Lieutenant in the department. Mr. Edward M. Ornitz, the San Francisco representative of the same company, has joined the Engineer Corps as a First Lieutenant. The San Francisco office will temporarily be in charge of Mr. T. M. Avery, formerly one of the New York City representatives.

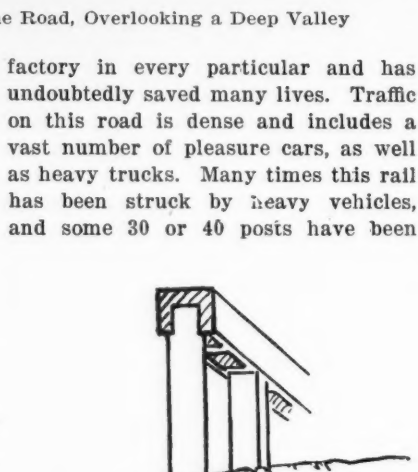
Concrete Guard Rails at a Turn of the Road, Overlooking a Deep Valley

Concrete Guard Rails.

Many stone quarries are excavated close up to a street, and in numerous instances serious accidents have occurred. The edge should be protected by a substantial wall or rail, and the same precaution should be taken on highways where there is a steep descent on either side. Mr. Geo. C. Wright, assistant county engineer, Monroe, Co., New York, in the Concrete Highway Magazine, gives this design of an effective barrier.

J. Y. McClintock has devised a steel concrete guard rail which has been adopted as a standard of the New York State Highway Department. It has been erected on more than fifty improved highways in New York, Massachusetts, Pennsylvania, and also in New Jersey on the great automobile outlet of New York City across the Hackensack Meadows, where 25,000 feet of guard rail is rendering excellent service on the Belleville Turnpike.

The guard rail shown in the illustration which accompanies this article was erected under the direction of T. J. Wasser as county engineer of Hudson county. It has proven satisfactory in every particular and has undoubtedly saved many lives. Traffic on this road is dense and includes a vast number of pleasure cars, as well as heavy trucks. Many times this rail has been struck by heavy vehicles, and some 30 or 40 posts have been



Construction of the Guard Rail

broken, but in no case has a machine gone through.

The anchor rods are three feet long, passing through each post at right

angles with the axis of the road, and through a substantial concrete block two feet long which is embedded in the ground on the highway side of the fence, thus effectively preventing the fence from being overdrawn by a blow of a machine.

In Monroe county, where the people take a justifiable pride in the character of the large mileage of improved roads, this concrete guard rail is generally used.

The Ohio Agricultural Lime and Limestone Law.

One of the laws enacted by the last session of the Ohio Legislature is known as the Ohio Agricultural Lime and Limestone law. The title describes the purport in general, and the law provides for manufacture and sale of these materials stating the requirements, methods of testing and penalties for the non-observance of the various sections, as well as the method of administering the entire law.

Through the courtesy of Mr. G. J. Wilder, manager of the Agricultural Lime and Limestone Association, through whose efforts the law was passed, we have received a copy of the law and quote from some of the leading sections:

Section 1. Before any Agricultural Lime or Limestone is sold, offered or exposed for sale in Ohio, the manufacturer, importer, dealer, agent or person who causes it to be sold or offered for sale, by sample or otherwise, within the State, shall file with the Secretary of Agriculture at Columbus, Ohio, a statement that he desires to offer such Agricultural Lime or Limestone for sale in this State and also a certificate, the execution of which shall be sworn to before a notary public, or other proper official, for registration, stating the name of the manufacturer, or shipper, the location of the principal office of the manufacturer, or shipper and the place of manufacture, the name, brand or trademark under which the Agricultural Lime or Limestone will be sold, the source and state of combination and a chemical analysis stating the minimum percentum of Calcium and the minimum percentum of magnesium and the neutralizing power in terms of calcium carbonate, and the percentum of the total material that will pass through a one-hundred mesh sieve, the percentum of the total material that will pass through a fifty mesh sieve, the percentum of the total material that will pass through a ten mesh sieve, and the percentum of the total material that will pass through a four mesh sieve, except in the case of fineness of Agricultural Limestone Screenings as hereinafter specified, in which case the source and state of combination and a chemical analysis stating the minimum percentage of calcium and the minimum percentage of magnesium and the total neutralizing power in terms of calcium carbonate, and the mesh sieve through which 100 per cent of the material will pass need only be given; provided that statement as to the degree of fineness shall only apply to marl, limestone and other carbonate forms.

Section 2 provides for marking shipments, showing the manufacturer or shipper, analysis, fineness, etc.

Sec. 3. The term Agricultural Lime and Limestone as herein used shall include all calcium and magnesium products sold for agricultural purposes in the oxide, hydrate or carbonate forms; such forms being designated as Quicklime, Hydrated Lime, Carbonate of Lime, Agricultural Ground Limestone, Agricultural Limestone Meal, and Agricultural Limestone Screenings.

Agricultural Ground Limestone shall be the term used to designate limestone of such a degree of fineness that 95 per cent will pass a 10 mesh sieve, 50 per cent will pass a 50 mesh sieve, and 30 per cent will pass a 100 mesh sieve.

Agricultural Limestone Meal shall be the term used to designate limestone of such a degree of fineness that 100 per cent shall pass through a four mesh sieve, 80 per cent shall pass a 10 mesh sieve, 30 per cent shall pass a 50 mesh sieve, and 20 per cent shall pass a 100 mesh sieve.

Agricultural Limestone Screenings shall be the term used to designate any limestone product which fails to measure up in any respect to the requirements stated for Agricultural

Limestone Meal and which is of such a degree of fineness that 100 per cent will pass through a 3 mesh sieve.

By 3, 4, 10, 50 and 100 mesh sieves are meant sieves with 3, 4, 10, 50 and 100 meshes respectively per linear inch, according to the specifications of the American Society for Testing Materials.

Section 4 provides for licensing those offering those products for sale.

Section 5 provides penalties for any violation of the preceding sections.

Section 6. The Secretary of Agriculture shall annually analyze, or cause to be analyzed, at least one sample of each kind of Agricultural Lime or Limestone sold or offered for sale within the State under the provisions of this chapter if found upon the markets of the State. The said Secretary of Agriculture is hereby authorized and directed, either in person or by deputies, to take a sample for said analysis from any lot or package of Agricultural Lime or Limestone which may be in the possession of any manufacturer, shipper, importer, agent or dealer therein, or while in transit in the State upon tender and full payment of the selling price of said sample. The result of the analysis of the sample, or samples, so procured, together with such additional information as circumstances advise or suggest, shall be published in reports or bulletins issued from time to time, and also be a basis upon which prosecution may be brought.

Any person who is not a dealer in, or agent for some Lime or Limestone company, can forward sample of Agricultural Lime or Limestone for analysis to the Secretary of Agriculture at Columbus, Ohio, express charges prepaid, by putting at least two pounds thereof into two cans, or jars, marked to identify it and show by whom sent, with the name and address of the person or firm from whom the Agricultural Lime or Limestone was purchased, and the amount purchased, accompanied by a fee of one dollar for each element for which analysis is asked.

Section 7. All the samples of Agricultural Lime or Limestone for analysis by or under the direction of the Secretary of Agriculture shall be from goods that have not been injured in transit, or by exposure; the surface layer to be avoided when sampling oxide of lime or hydrate of lime, and the sample to be protected immediately by placing it in package or packages and promptly sealing before forwarding to the Secretary of Agriculture for analysis.

Sections 8 to 13 provide for the enforcement of the law, making it probably the most effective law ever prepared on this subject.

NIAGARA LIMESTONE

What is known to geologists as Niagara Limestone has probably been the most generally used stone of any formation the world over. It is the stone of Lockport, N. Y., Joliet, Ill., and elsewhere in this country and Europe. It is fine grained and easily worked, and when laid in the wall is among the most beautiful of all building stones.

The House of Parliament, Westminster Abbey, and other public buildings in England are of this formation. A church in Nottinghamshire built of it a thousand years ago is still in a good state of preservation.

Its character is such that the longer it is exposed the harder it becomes, rivaling in this respect, granite itself. Buildings in this country built of it generations ago are uniformly sound and uninjured.

No stone is mor easily taken out than this. Regular lines of stratification exist throughout the whole extent of the group—varying in thickness from a half an inch to three feet. The bottom layers are much more tenacious that the upper, and are suitable for any purposes, whether abutments of bridges, mill dams or buildings.

When first quarried it can be cut with the greatest ease. Stone cutters delight to dress it. It can be carved, polished, rockfaced, hammer dressed, and will look well in any way. In contrast with brick when laid in a wall it is extremely pleasing to the eye, worked in any of these ways.

The Economic Operation of Crushed Stone Quarries.

(The first of a series of articles on handling the details of quarry operation. Dealing with the general division of quarry work and the selling of the products. The second article will appear in an early issue.)

Crushed stone quarrying is fast becoming an extensive business and more quarries are being developed for this purpose than for all other classes of stone products. It is a peculiar business. Profitable at times, in other seasons it is difficult to make it pay. Then, too, if quarries must compete in the large gravel deposits, there is a chance that the product may have to be sold at a low price. At present, conditions in the business world are abnormal and the price of crushed stone in most sections of the country is high, so that the majority of quarries are doing a good business and at a profit. A little more than a year ago the conditions were reversed. The price of labor and explosives had increased and were going higher, yet crushed stone was selling at the price it had brought before there was an increase in the cost of production.

When the reaction comes in business, the same conditions are likely to exist again. The wise man prepares for adverse time during his periods of prosperity.

Consequently it is the part of wisdom to make a careful analysis of crushed stone quarrying, with the idea of making a study and developing such a system that a quarry can be handled at a profit, whether business conditions are favorable or unfavorable.

It is with these ideas in mind that the writer will make an analysis and outline a general system of developing and working quarries and of handling and selling crushed stone products.

To do this three divisions will be made.

1. General Method of Working and Developing Quarries.

2. Operating the Quarry and Crusher Plant.

3. Selling and Office Management.

The first division is not only important when first starting a quarry, but also as it is being operated from year to year. There must be an immediate decision as to what level the floor of the quarry is to be established; the heights of the different lifts in which the ledge is to be worked. The stripping of the rock must be decided upon, and the methods to be followed. Some base line should be established so that measurements can be made from it and levels run to different points so as to make layouts for blasts and calculate yardage and tonnage moved.

Unfortunately few quarrymen pay much attention to this planning and development of their ledge. They decide where to start an opening then leave it to their foreman and drillers to develop the quarry as they see fit, and these generally work the ledge the easiest way for themselves, seldom considering the future or whether an economical method is being followed.

The writer recently visited a quarry in which six openings have been made, none of which show economical work and all handled so as to make future work expensive. It is an old quarry, well situated, susceptible of being developed on an extensive scale and exceedingly economically, allowing of large forces being worked to produce an extensive output. It is being handled by a small force and only a limited amount of crushed stone is produced daily. It will take a large sum of money to re-develop this quarry along modern lines, in order to work it economically and obtain a large output. What is true of this quarry is the case with many others. During the

last three years the writer has worked in a large number of quarries and has visited nearly a hundred quarries, and less than ten per cent have been properly developed and laid out along economical lines.

Stripping is all important, especially today when many quarries sell nearly all their screenings and crusher dust. These must be free from dirt, thus making it important to have the stone perfectly free of earth and dirt when fed into the crusher, unlike in the days gone by, when such dirt was screened out in the dust and thrown away. The stripping of quarries will be dealt with in another article.

The operation of the quarry and crusher plant is the second division of quarrying. The details are too numerous to treat in a single article, but the work can be standardized along the following lines.

1. Drilling.
2. Blasting.
3. Breaking.
4. Loading.
5. Transporting (including weighing).
6. Crushing.
7. Elevating and Conveying.
8. Loading Crushed Products (including weighing).

Each of these sets a division of work to study and place on a standard. Weighing is included, when men are paid for loading cars by the ton and scales are used between the ledge and the crusher to weigh each quarry car. If stone is weighed on teams, trucks or cars when sold, weighing is included in loading the crushed products.

With divisions and subdivisions such as these it becomes possible to plan each detail of the operation, and make such studies as will give harmonious results from each unit of work. It is possible to so regulate the various gangs as to obtain the maximum output with the minimum expenditure.

With these units and a ninth one, overhead charges, it becomes possible to keep exact cost records of all operations. Costs kept in this manner and in such detail, would allow a standard cost to be set for each unit, and daily costs should vary but slightly. If the costs run up, the wastes could be located at once an immediate steps taken to eliminate them. If the costs are lowered for any length of time, new standard costs could be set and larger dividends earned from the quarry. This shows how it is possible to take systematic steps to reduce the cost of producing a ton of crushed stone.

In this connection the working of the quarry in one or more lifts or in several levels can be taken up and decided from actual costs showing whether it is cheaper to work in one, or two or more lifts.

The power plant would also come in for close inspection and for a study to place it on an economical basis. The crushers, too, could be studied, and re-arranged if possible to obtain more efficient results.

The elevating, screening and conveying machinery would also come in for the same sort of inspection and study, so as to make the operation here as cheap as possible.

Under overhead charges, besides a large number of items of the quarry operation, comes the third division of office management and selling.

Selling in any line is all important today. More attention is being paid to salesmanship in modern business than ever before. There is much to the subject, and it is one to be analyzed and considered from many new points. The success of every business depends upon the selling end, yet there must be efficient management even to allow a salesman to make sales in competition with others. Thus the development and operation of quarries lead up to the selling of the quarry products.

Gravel Roads in Michigan.

During the years 1915 and 1916 nearly 1,000 miles of gravel roads were built in Michigan, making a total of 2,538 in the state. This is about 60 per cent of all the roads accepted by the state.

The popularity of gravel roads in Michigan is largely due to the prevalence of suitable gravel and its utilization in localities where the traffic is not so excessive as to cause high maintenance is in accord with the best engineering practice. Considerable effort has been made by the State Highway Department to develop the most satisfactory methods for the construction of gravel roads. Water-bound macadam is growing in favor, especially where with a bituminous surface treatment there is excessive traffic. This surface treatment costs about five cents a yard for the first application and about three cents a yard thereafter.

Unloading Cars.

The value of using car unloading devices cannot be questioned, but there are many cases where only a single car of sand, gravel or stone must be handled at a time, or cars at long intervals, so that an unloader could not be installed. The quick unloading hoppers can be used in such cases, but hand shoveling must be done with these. Team time can thus be saved, but the shoveller may not put forth any special effort to do the unloading cheaply.

An eastern contractor has solved this problem in a satisfactory manner. He found that under favorable conditions he could handle with his teams and men enough material in a day to make his teams earn from eight to ten dollars per day. He felt he could effect quicker deliveries and make his team earn more money for him by offering his men and drivers a bonus for extra work.

He accordingly figured out the number of loads that could be made over certain distances in a work day and gives his men a bonus for this number of loads, stipulating not only the number of loads but a minimum tonnage. The bonus may amount to more than their daily wages.

The results in many cases have been astonishing. The men have not only loaded the vehicles to their full capacity, increasing the tonnage in this way, but they have worked faster and cut out all waste time. The men have not only earned more money for themselves but the contractor has added greatly to his earnings. It has not been uncommon for teams to earn fourteen dollars per day, in some cases sixteen dollars, and on a few occasions up to eighteen and twenty dollars. The extra dollars paid the men have been small as compared to the contractor's earnings, and he has pleased his customers by giving them quicker deliveries than others are making. A bonus is a wonderful incentive to make a man think and put forth greater exertions.

A City Owned Quarry.

Marlboro, Mass., once had Grover Cleveland for a visitor, and, on entering a shoe factory his foot was measured. When he left he was handed a finished pair of shoes. That is the way Marlboro does. So when stone for the streets was needed, the city promptly bought a quarry, securing stone for their own and the neighboring "boros," of which there are many. A recent meeting of the council discussed motor trucks for hauling the crushed stone, and it is a safe bet they will have a fleet of them very soon.

Don't Blow a Fuse.

It may sound ridiculous, but there is a necessity for caution around fuses and powder. A workman in an eastern quarry lost an eye because he thought to hurry a lagging fuse by blowing on it.

New Companies.

The Royal Sand Company, Columbus, O. F. A. Downard, H. L. Cadot, A. H. Johnson, D. M. Johnson, D. M. Hamilton and J. R. Tingle, incorporators, $10,000.

The Valley View Lime, Clay and Coal Co., Sugar Creek, O. R. D. Guss, Whit Johnson, George W. Davies, Homer Shonk, Lloyd Shonk and Michael Reiswick, incorporators. $30,000.

Elkins Limestone Crushing Company, Elkins, W. Va. Capital stock, $25,000; incorporators, L. C. Massey, S. D. McGee, W. H. Larson, S. O. Bird, of Charleston, and W. M. Farmsbrough, of Atlanta, Georgia.

The Broadway Sand, Gravel and Art Stone Company, Cleveland, Ohio, incorporated by Frank Vondraeck and others. $35,000.

West Jersey Sand and Supply Company, Camden, N. H. Capital $100,000; incorporators, F. R. Hansell, J. R. McPeak and J. C. Clow, all of Camden.

Lincoln Crushed Stone Company, Joliet, Ill. Capital $15,000; incorporators, Herman Greenberg, Sam Greenberg, Hjalmar Rhen.

Perry Coal and Sand Co., Columbus, Ohio. $15,000. George C. Butt.

New Lexington Sand Company, New Lexington, O. $10,000. J. F. Nugent.

Universal Sand Co., Newcastle, Pa. $40,000. R. H. Hangst, incorporator.

The Newpoint Ground Limestone Company, capitalized at $10,000, will manufacture fertilizer at Newpoint, O. J. J. Puttmann, George Redelman, and Anthony Habig are interested in the company, and it is said the stone in the quarries tests high for fertilizing purposes.

Articles of incorporation have been filed for the Centlivre Sand and Gravel Co., at Anderson, Indiana. The capital stock is $10,000, and the directors Louis A. Centlivre, Charles F. Centlivre and Edward G. Franke.

Walter W. Dewees, Harry M. Kurtz and Walter K. Makin are the incorporators of the Coosa Cement Co., of Camden, N. J., with a capital of $10,000, to mine and quarry shale.

The Columbus Gravel Co., Columbus, Ohio, with a capital stock of $5,000, will deal in all kinds of building material and fuel. John C. Hinshaw, Robert E. Johnson, Jesse A. Shearer and Frank J. Billeter are the directors.

The Concrete Gravel Co., Wilmington, Del., will mine or remove gravel, rock and sand from land and develop same. The capital stock is $15,000, and the incorporators are C. L. Rimlinger, M. M. Clancy and Clement M. Egner.

The United Quarries Company, Sandusky, O., has been incorporated with $750,000 capital, by August Wenger, E. A. Sutton, J. Herrick, J. J. Dauch and Hoy H. Shively.

The Silica Sand Co., of Michigan City, Ind., will buy and sell sand. The company is incorporated for $5,000, and the directors are Carter H. Manny, Wilbur L. Rawlings and Oliver C. Deming.

Among the new Michigan companies we find the name of Consumers' Gravel Co., Detroit, incorporated for $75,000.

Items of Interest.

H. Chase and S. Linton have just completed a sand and gravel plant at Oregon City, Oregon. It is said to be one of the finest plants in the state.

Guin, Alabama, announces that the Guin Gravel Co. will soon be in a position to furnish the finest kind of sand and gravel. Shipping facilities are excellent and the gravel is said to be particularly adapted for road construction.

The Philadelphia Quartz Company, Berkeley, Cal., expect to have their $100,000 silicate of soda plant in operation this fall.

Sand or gravel cannot be taken from the Mississippi river after August 1,

except by permission of the Secretary of War. A ruling to this effect was made by the Mississippi River Commission at a recent meeting. Hitherto anyone has been allowed to pump sand and gravel from the river, but the dredging in some instances has caused more or less trouble in river improvement work. Aside from this the government may desire to take over certain gravel deposits to carry out future projects.

A superior quality of granite, said to rival the product of the Barre, Vt., quarries is being produced by the Treasure State Granite Company of Livingston, Montana.

Operating an electric plant in connection with its quarries has not been entirely satisfactory to the Merced Stone Co. of San Francisco. As a consequence they have filed an application to allow the sale of the electric plant to the San Joaquin Light and Power Corporation of Fresno.

The Yuba River Sand Co., of Sacramento, has secured the contract for furnishing 12,750 tons of sand for use in the construction of county highways. The price was 72 cents per ton.

Soren Termanson, general manager of the Sturgeon Bay Stone Co., states that his company has contracts for all the stone it can deliver this season. Contracts could be made for the entire output next season, but the unsettled business conditions make it inadvisable to enter contracts for future delivery. Twenty-four thousand tons of stone have been delivered this season, the last boat loads going to Grand Haven, Michigan for the government breakwater.

A new freight yard is being constructed by the St. Joseph Valley Railway Company at Elkhart, Ind., to accommodate the traffic in sand, gravel and marl from the various beds along the railroad. The new yards will have depressed team tracks to facilitate unloading directly into wagons or trucks. There will also be team tracks on a level with the rails. The United States Gravel Co. has a gravel plant covering 93 acres as well as extensive marl deposits in the nearby lakes.

Long Beach, Cal., will soon see a three-cornered project. The Los Angeles Rock and Gravel Company expect to remove Signal Hill, making the space into a beautiful residence section. The sand and gravel will be reclaimed for building purposes, while the loam and clay will be used to reclaim nearby swamp lands. This might be called 300 per cent efficiency.

Silica sand is being taken from an 8-acre deposit near Kilbourne, Wisconsin, by the Walsh Sand and Gravel Co. of Burlington, Wisconsin.

Gov. Bilbo of Mississippi is trying to finance two limestone plants to furlish agricultural limestone as well as road material for his state.

The $50,000 plant of the Ottawa Silica Co., at Ottawa, Illinois, is about ready for operation. The new plant will be a short distance from the old plant which has been in operation for many years, and which is famous for furnishing the standard testing sand used in most cement tests. The plant is built of reinforced concrete, with complete equipment for handling sand, such as elevators, separators, washers, dryers, pulverizers, etc. A peculiarity of the "sand" is that it occurs as sandstone and is quarried in a similar manner to stone, but on exposure to the air the blocks fall into sand. The sand is largely used in the manufacture of glass.

Rossi Bros., proprietors of the Silver Grey Granite Co., in the El Cajon Valley, near Lakeside, Cal., have arranged to pave with granite the two and a half mile highway to the nearest railroad. By using large motor trucks they will then be able to make shipments promptly. This quarry is said to be about the only grey granite quarry on the California coast.

We Are the Pioneer Manufacturers of Gravel Washing Machinery

The first gravel washing plant was an "S-A" Plant. We developed the original gravel washing machinery which is still recognized as standard. In fact, the records will show that we actually developed the industry.

Altogether in the past fourteen years we have designed and equipped about 400 gravel washing plants. Each one of these was especially designed—each one has been a *commercial success.* We have turned down orders for a number of plants where the elements of success where lacking. We have turned failure into success for several others by re-equipping with "S-A" Machinery.

We have a strong organization of engineers—and a large plant devoted to the manufacture of the highest grade of conveying elevating, screening and transmission machinery.

It is to your interest to deal with manufacturers and not jobbers

"Ask the Man Who Owns One"

The following is an incomplete list of the newer "S-A" plants

Gravel Washing

Los Angeles Rock & Gravel Co.
Scottsville Sand & Gravel Co.
Montana Concrete Co.
Vandalia Railroad.
Standard Builders' Supply Co.
Hawarden Sand & Gravel Co.
H. D. Conkey Sand & Gravel Co.
F. A. Downs Construction Co.
Mason City Sand & Gravel Co.
Jensen & Jensen.
Virginia Sand & Gravel Co.
L. D. Burd.
Wabee Gravel Co.
Summit Sand & Gravel Co.
Geo. J. Hoffman.
Logansport Gravel Co.
Battjes Fuel & Supply Co.
Wabash Sand & Gravel Co.
Macksville Gravel Co.
Mason City Sand & Gravel Co.
Covington Sand & Gravel Co.
American Agricultural Chemical Co
Madison Construction Co.
Windsor Sand & Gravel Co.
Atwood Davis Sand Co.
Lake County Gravel Co.
Chas. Vivian.
Vigo Washed Sand & Gravel Co.
Interstate Material Co.
H. W. Hawly.
Wabash Sand & Gravel Co.
Kingsley & Pagant.
Pueblo Bridge.
Minden Gravel Co.
C. H. Billings.
Canada Sand & Gravel Co.
C. H. Little & Co.
Beaver Sand Co.
McCraney Sand Co.
Coon River Sand Co.
Downs Construction Co.
Virginia Sand & Gravel Co.
Chicago Gravel Co.
Hoyt Mining Co.

Stone Washing

Brownell Improvement Co.
Peoples Crushed Stone Co.
U. S. Crushed Stone Co.
Big Rock Stone & Const. Co.

"S-A" Equipped Crushing Plants

A. C. Laughlin Stone Co.
France Stone Co.
General Crushed Stone Co.
National Lime & Stone Co.
Bessemer Limestone Co.
Branchton Limestone Co.
Blair Limestone Co.
Standard Lime & Stone Co.
Union Lime Co.
Elmhurst & Chicago Stone Co.
Leathem & Smith.
Greenleaf Stone Co.

We'll gladly supply the address of any of the above for reference or send names of "S-A" plants in your territory

Put your proposition up to us and we'll help you make it pay

Stephens-Adamson Mfg. Co.

Aurora, Ill.

The Calcite Quarry Co., having extensive limestone quarries near Myerstown, Pa., is making many improvements with a view of greatly increasing the output.

The joint sand and gravel rate order made by the State Utilities Commission for the Chicago Switching district is not unreasonable, according to the decision of the Supreme Court. The rates are $4 per car of 60,000 pounds or less, plus 10 cents a ton for excess over 60,000, over the Chicago rates.

Taking sand and gravel from the river bed brings up new problems. In Muskogee, Okla., it has been considered advisable to compel those taking sand or gravel from a bar in the Grand river, to take it from the extreme end, so as to avoid creating a new channel which might leave the pumping station a mile from any water.

Joseph W. Webb, for two years with the Lincoln Sand and Gravel Co., of Lincoln, Ill., has become sales manager of the Northern Gravel Company, of Muscatine, Iowa.

Burt Scott, formerly superintendent of the Williamsport, Ind., light and water plant, is now superintendent of the Carmichael Gravel Co., of the same place.

Light for Dark Places.

Every contractor is compelled at times to do night work or work in dark basements, tunnels, etc., where artificial light is required. At such times the men appreciate good lights, such as that given by the New Milburn Carbide Lights made by the Alexander Milburn Company, Baltimore, Md.

These lights use calcium carbide, which can be obtained almost anywhere, and they give a healthful and efficient light. The light can be placed where desired, giving a broad general illumination or a concentrated light on one spot.

Better secure Bulletin 216 which describes the several styles and sizes of these lights, and then have such an assortment that your work will proceed without interruption.

The Buchanan All Steel Rock and Ore Crusher.

Whenever we think we know it all, we like to receive a circular such as Bulletin No. 10, issued by the C. C. Buchanan Co., 90 West street, New York. It shows us how little we know and how small our ideas are compared to those who specialize in heavy machinery.

The Bulletin describes only one type, "C," of crushers, but as it is built in capacities from 45 to 450 tons per hour, the style or size desired can readily be selected. This type of crusher is made with several adjustments, such as for various size stone, etc., and can be adapted to practically any condition or location.

The Bulletin will be sent free on request and should prove valuable to every one of our readers.

Comparisons.

Comparisons are not always pertinent, and yet the increase in value of motor trucks over horses is an indication of the value of the former. One or two men might be mistaken in the economy of keeping an automobile, but you could hardly mislead 80,000 in Los Angeles county, California, alone.

About a dozen don'ts give the more important reasons for the rapid decline of the time honored horse, in the opinion of E. A. Williams, Jr., president of the Garford Motor Truck Company.

"In the first place," he says, "motor trucks don't eat every time they stand still. They don't keep you up at night with the colic, or other ailments to which the equine body is heir. They don't have distemper. They don't balk if you feed them and take care of them. They don't have lockjaw, or something equally serious, when they step on rusty nails, but they keep right on about their business.

"They don't die. They don't have broken or lame legs. They move four times as quickly as horses. They advertise your business. They create new business. They keep customers satisfied. They are always a valuable asset."

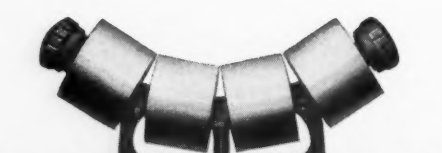
The Value of Good Light.

When the call comes for night work the contractor should be prepared to meet it. Good light means good work and more work for the money. How

CALDWELL MACHINERY

FOR HANDLING

Stone, Gravel, Sand



Screw and Belt Conveyors, Steel Elevator Casings and Buckets, Gears, Cut and Cast Teeth, Link Chain Belting, Shafting, Pulleys, Sprocket Wheels, Etc.

H. W. CALDWELL & SON CO.

CHICAGO

Western Ave., 17th to 18th Sts.

can you expect a man to work at the highest efficiency when handicapped by a flickering oil lamp? You are wasting money and time, besides impairing the health of the men.

Get good, reliable lights, such as the flare-lights made by the Carbic Manufacturing Company, Duluth, Minn., and described in the catalogue which they have ready to send you.

Grab Buckets.

Excavating in loose material such as sand and gravel is particularly suited to the Brosius grab buckets, made by Edgar E. Brosius, Pittsburgh, Pa. There are a number of styles and sizes, each having its advantages for certain classes of work, and a catalog describes the various styles and gives a great deal of information regarding their operation, etc.

Loading Wagons.

There may be times when it is advisable to load wagons by hand, but as a rule it is the most expensive way. Besides loading at small expense, the first cost of loading device is not very great. One style make by the Gifford-Wood Co., Hudson, New York, will load a ton in two minutes. Just compare that with picking up sand or gravel from the ground and tossing it into a wagon.

In these days of motor trucks the idea is to keep the trucks on the move. In the old wagon days one had to rest the horses sometimes and it didn't make so much difference. Now it will show a good profit on every load handled by a loader.

A complete catalog showing the varioout styles of loaders will be sent to our readers by the Gifford-Wood Company on request. It will suggest economies in handling all sorts of materials.

The Blaw "Bull Dog" Bucket.

As sand, gravel and crushed stone operations vary from handling soft mud to the stiffest clay and hardest rock, it is easily seen that any equipment must be capable of handling almost any materials. The Blaw Bull Dog Excavating Bucket is designed for the heaviest and hardest work, and yet can be quickly adapted to any lighter work which may be required. How the bucket is built and how used may be seen from a circular which the manufacturers, the Blaw-Knox Co., Pittsburgh, Pa., will be glad to send to our readers.

An Announcement.

The Interstate Equipment Corporation announce the renewal of its offices at 10 Wall street, New York .

This company has recently taken over the manufacture of the Lawson Automatic Tramway, which is especially designed for transporting materials in bulk such as coal, ore, sand, gravel, clay, timber, cement, etc. The shops of the Interstate Equipment Corporation at Roanoke, Ia., are prepared to make prompt shipment of all the standard lines of equipment.

Crushing and Pulverizing Stone.

Not long ago we stopped to watch a number of men working out their poll-tax breaking stone. They didn't turn out a very large pile in the time we watched, and it seemed like an awful waste of time. A machine would turn out more in a minute than they could in a day, and at a great saving in cost.

They had one right idea, however. The stone was broken up with a hammer, and a comparatively light blow on a particular stone usually cracked it. This is practically the same principle used in the American Ring Pulverizer, made by the American Pulverizer Co., East St. Louis, Ill. This Pulverizer can be used for sandstone, Gypsum, Shale, Slate Slag, Glass Cullet, Terra Cotta, Phosphate Rock, Agricultural Limestone, etc., and the patented action is described in a circular which the manufacturers will be glad to send on request.

Qualities for Wire Screens.

Among the requirements for a suitable sand and gravel screen are Uniformity and Durability. The former is necessary in order to meet the stringent specifications prepared by engineers and others who know what they want and insist on getting it.

Durability is even more desirable, as without it the screen becomes a curious mixture of big and little holes, the former passing material too large and the latter retaining that which should go through.

The Cleveland Wire Cloth Co., 35-73-81 East Seventy-eighth street, Cleveland, Ohio, believes their screens have both of the above qualifications in the

Digging Deep For Its Load

Filled—and then some—at every grab—the "Blaw" Bucket works *far in excess of its rated capacity.*

"Blaw" Buckets

are tremendous cost cutters in any material where a bucket can be used. Added to the economy secured by its speed in digging and handling materials, there is *the big saving due to low maintenance cost.*

In stock, for prompt shipment, are "Blaw" Buckets for every need of the contractor.

Write for the "Blaw" Bucket Book

Blaw-Knox Company

605 Farmers Bank Building
PITTSBURGH, PA.

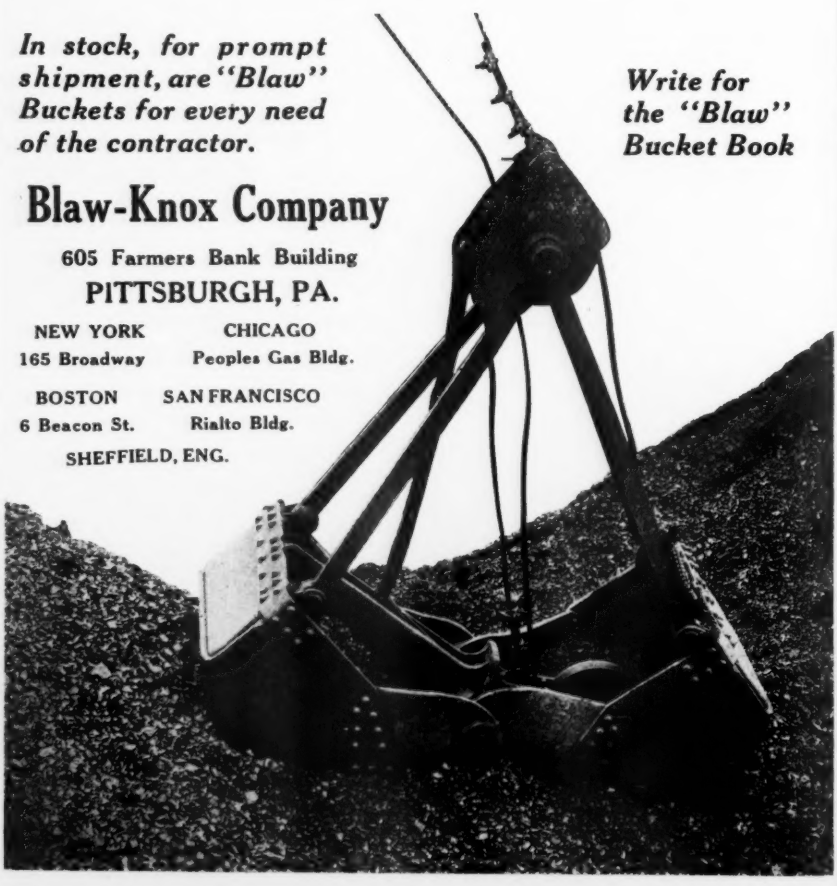
NEW YORK
165 Broadway

CHICAGO
Peoples Gas Bldg.

BOSTON
6 Beacon St.

SAN FRANCISCO
Rialto Bldg.

SHEFFIELD, ENG.



highest degree. They aim to keep a large stock on hand, so as to fill orders promptly, but to keep up with the increasing demand they have been compelled to practically double their floor space by the erection of new buildings. It might be well to have their catalog on hand so as to place an order for coming requirements.

Unloading Industrial Cars.

When one considers that the greatest cost of raw materials is for labor it is readily seen that the more we can replace hand labor by machinery, the more efficient our work will be. Loading cars, whether with coal, stone, gravel, sand or other raw materials, is quickly accomplished by various means such as steam shovels, scrapers, hoppers, and the like, while unloading has heretofore been a little more complicated.

The Link-Belt Company has for some years been making an unloading device which has been widely used in coal mines for unloading cars, and the device is one which we believe is well adapted for use in stone quarries, gravel pits, and similar industries. As will be seen from the illustrations, the device consists of a rotating cylindrical frame in which the car is placed. The revolution of the frame carries with it the car which quickly dumps out the materials into the hopper below.

A feature of this system is that the cars are connected with a swivel coupler so that it is unnecessary to uncouple the cars when passing through this dump.

Figure 1 shows the car in the frame ready to start dumping. Figure 2 shows carriage released and the car about to start. Figure 3 shows the car dumping, and Figure 4 shows the car about to stop again after the complete revolution.

A photograph of a car about to be dumped is shown in Figure 5, and this will give one an excellent idea of the entire operation. The Chicago office of the Link-Belt Company at 39th and Stewart avenues, Chicago, Illinois, will be glad to send prices and further detailed information regarding this device to those who are interested in the rapid handling of stone, gravel, and similar materials.

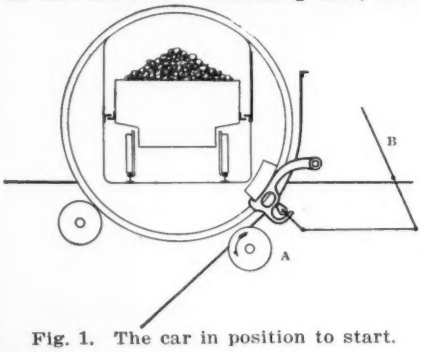


Fig. 1. The car in position to start.

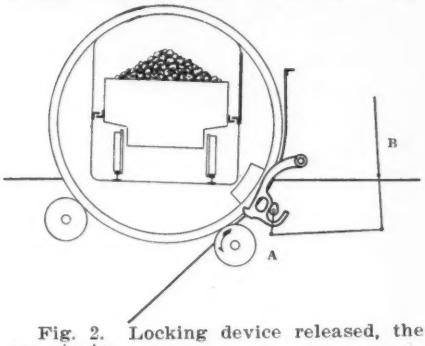


Fig. 2. Locking device released, the car starts.

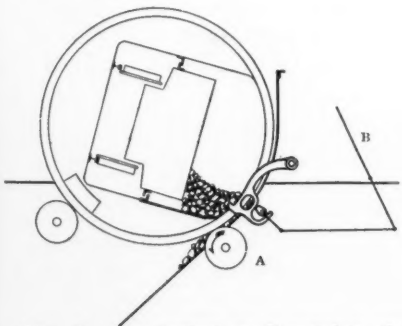


Fig. 3. Car dumps as it reaches the proper angle.

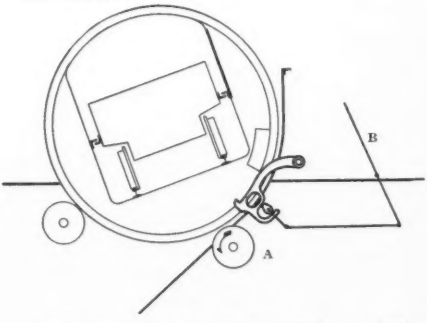
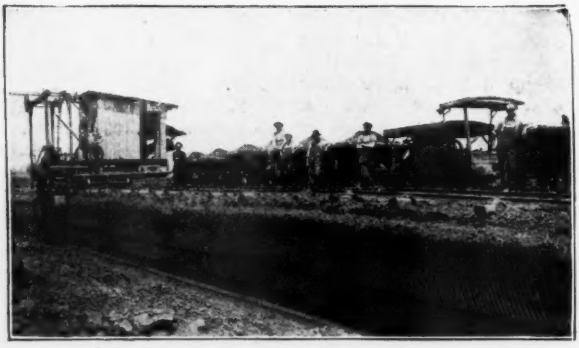


Fig. 4. Nearing the complete circle, the car emptied while revolving.



The Plymouth Hauling Clay for the Claycraft Brick Co.

"Cheaper in Clay Pit Than Horses" —*Says M. J. Kaufman*

It costs the Claycraft Brick Co., of Columbus, O., less than half to haul clay with a Plymouth-drive Gasoline Locomotive than with horses, besides adding six more cars and keeping the digger and pit men busy.

The Plymouth
Friction-Drive Gasoline Locomotive
Cuts Haulage Costs One Half

The Friction-drive, Continental Motor, Hyatt Bearings, and Heavy Frame—simplest and best of construction, is The Plymouth's secret. No expensive gears—lubrication eliminated—repairs nil. A day-laborer and 5 gallons gasoline run it 10 hours. It takes higher grades, outpulls all locomotives and costs half or one-third less to buy.

Kaufman Proves This:

"Six horses cost us $2.25 daily to feed, and three drivers $1 a day each, making $5.25 daily," says M. J. Kaufman of the Claycraft Brick Co. "The Plymouth costs us 67c for gasoline, 5c for oil and $1.50 for the operator. Our saving of 20 cents per thousand brick paid for the locomotive and cars in one short season."

Book Tells: It describes this and other installations; and gives cost data regarding haulage problems similar to your own. Send for it.

THE J. D. FATE CO.

206 Riggs Ave., PLYMOUTH, O,

Gandy Belting.

While some men try to anticipate trouble, others seem to put off everything like preparedness until trouble comes upon them. The wise manufacturer keeps a supply of repair and replacement material always on hand so as not to be caught, during the busy season, by a breakdown costing many times the cost of repairs.

Belting is subjected to hard usage and stress and must be kept up all the time. The failure of a conveyor belt means a shut-down almost immediately, and so the wise operator keeps extra belting on hand. The Gandy Belting Company, 761 West Pratt street, Baltimore, Md., keeps a large stock of belting on hand so as to make prompt shipments, but it is a better plan to keep a stock for emergency right in your plant. Get the Gandy list of belting on hand and see if it will not pay you to order your stock now.

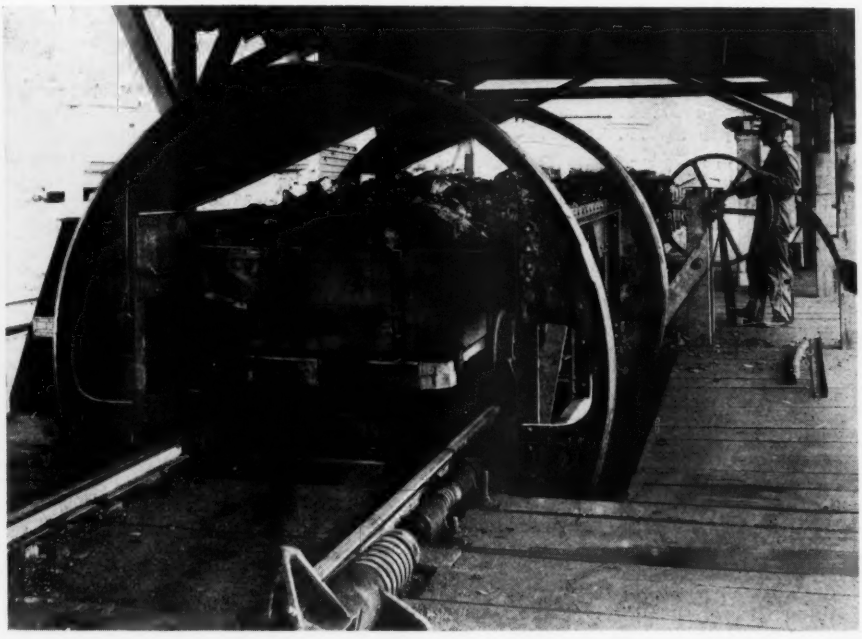


Fig. 5. A car in the frame. The operator about to start the mechanism to dump the car.

J. A. RIDGWAY
Woolworth Bldg
NEW YORK
Telephone:
Barclay 6398
New York Sales Agent for the
"Plymouth" Gasoline Industrial Locomotive
MADE BY THE
J. D. FATE CO

Annual Index.

A
Any More Architects Like This One ..... Oct. 14
Association Idea ..... Oct. 26
B
Be Sure You're Right ..... Jan. 9
Big Blast ..... May 41
Build Pier to Handle Sand and Gravel ..... May 39
C
California Plant in Detail ..... Mar. 28
Car and Wagon Delivery ..... Oct. 19
Cars Spotted by Hoist ..... Jan. 17
Chicago Producers Getting Together ..... Jan. 11

Concrete Guard Rails.....Sept. 32
Co-operation Among Wisconsin Producers .....Mar. 35
Cost Keeping for Quarries.... .....May 29-Sept. 30
Convincing Facts .....Oct. 27

D

Daily Invoice .....Jan. 25
Delivering Sand to Stock Pile..May 31
Difference of Opinion.....Mar. 38
Disappointed .....Jan. 25
Down Hill—or Up.....Oct. 14

E

Economic Operation of Crushed Stone Quarries .....Sept. 35
Efficient Rock Crushing Plant.Jan. 12
Electric Power .....Jan. 29
Electricity in the Quarry.....May 33

F

Failure and Success in Sand and Gravel Plants.....Jan. 18
Fontana Plant of Wilcox Co....July 20

G

General Method of Working Pits.....July 25-Sept. 26
Good Roads Resolution Boosts Prosperity.....Sept. 25
Good Sand and Gravel Plant..Oct. 21
Got Enough Capital?.....Oct. 14
Gravel and Sand.....Oct. 12

H

Hardpan and Clay We May Strike .....May 25
Hauled Gravel in Winter.....May 41
High Gravel Bank.....Oct. 27
Hydraulic Method of Stripping.Jan. 28

I

Investigate the Supply.....Oct. 23
Iowa Association Formed.....Mar. 35

K

Keeping Track of Deliveries..July 24
Know Your Material.....Oct. 27

M

Many Sizes at Small Expense.Mar. 34
Map Shows Location of Deposits .....Mar. 21
Methods of Operating Limestone Quarries .....July 26
Mississippi Sand Co. Plant....Sept. 34
Modern Sand and Gravel Plant.Oct. 8
Motor Trucks .....Oct. 23

N

New Rockford Plant.....Jan. 26
New Use for Old Pit.....Mar. 17
Niagara Limestone .....Sept. 34

O

Office End of a Sand and Gravel Business .....Oct. 16
Ohio Agricultural Lime and Limestone Law .....Sept. 33
Ohio Company Changes Its Name.....May 39
One Man's Cost of Handling Sand and Gravel.....Jan. 16

P

Pennsylvania Washing and Screening Plant .....Oct. 20
Percentage of Sand and Gravel .....Sept. 29
Pittsburgh Concern Uses Trucks.....Mar. 24
Plant for Handling Gravel....May 14
Preparedness .....Oct. 22
Preparing Rock Materials....May 39
Production Cost Important....Oct. 26
Production Cost of Washed Sand and Gravel.....Mar. 37

Q

Quarry of Petoskey Portland Cement Co. .....Sept. 20
Quick Work Erecting Big Stack.....Jan. 30

R

Rapid Loading .....May 39
Reducing Misfire Costs.....May 43
Reducing the Cost of Loading.July 39
Remodeling Plant .....May 32
Reputation Is Valuable.....Mar. 40

S

Sand and Gravel.....July 31
Sand Plant for Big Job.....Mar. 36
Saving Delivery Time.....Jan. 17
Shall We Sell by Weight or Volume .....Oct. 19
Sharp Sand Again.....Jan. 24
Side Lines for Pits and Quarries .....Oct. 28
Some Benefit of Local Co-operation .....Mar. 26
Some Items in Rising Costs...Mar. 18
Specialization Means Growth.Oct. 19
Stick to the Main Highway....Jan. 17
Stone Company Has Central Machine Shop .....Jan. 21
Standard Sizes of Stone.....Sept. 27
Stone Plant of Modern Type..Oct. 24

T

Two Plants of Richardson Sand Co. .....Sept. 22

U

Unique Sand and Gravel Plant .....Mar. 22
Unloading Plant .....May 18

V

Value of a Blasting Sheet....Mar. 19

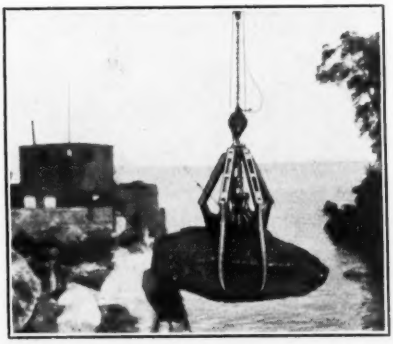
W

Weight of Sand and Gravel...Oct. 11
What One Association Is Doing.Jan. 10
Where Will Our Sand Come From? .....Mar. 40
Will Now Build Fireproof....Jan. 16
Winter Delivery .....Mar. 17
Working Quarries in Several Lifts .....Mar. 25
World's Largest Crusher.....Mar. 44

Y

Your Machinery Is Valuable..Jan. 22

Powerful Stone Grapple



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In Building Breakwaters

This Grapple built with forged fingers having tool steel points, will handle rocks up to twenty-five tons.

QUARRY GRAPPLE

THE QUARRY GRAPPLE

has capacity for a six or seven ton rock. Designed for use in stone quarries for picking up larger size stones. Hasmanganese steel castings or calks at lower extremities of the fingers, made separate and renewable.

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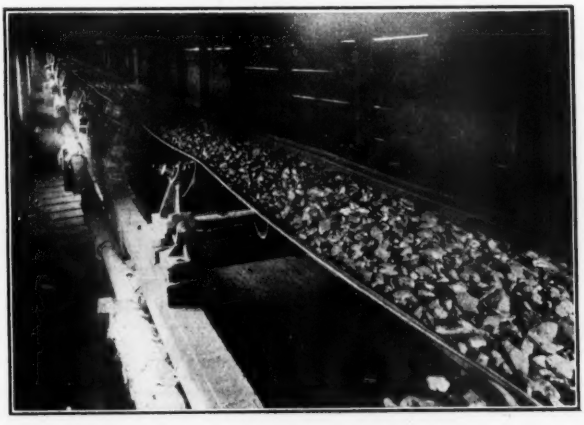

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Victor-Balata & Textile Belting Co.

Manufacturers of { "V-B" (Victor Balata) Belt "WHITE SEAL" "AMPERE" and "SPECIAL" Grade Canvas Stitched Belting

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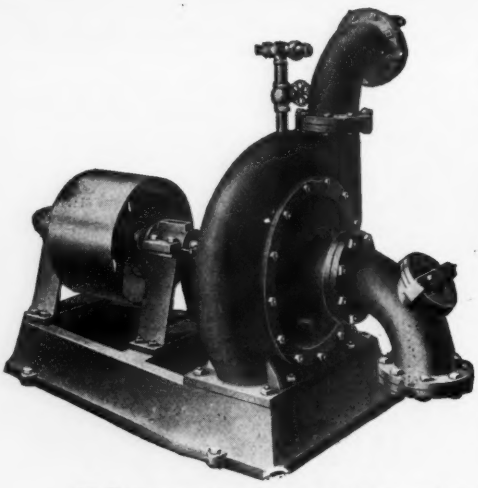

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Erie Sand-Gravel Dredging Pumps

Small sizes as well as largest ones are designed to give maximum output and greatest wear for a given weight.

Tell us your conditions giving total vertical lift with length of pipe line and ask for Bulletin P-30

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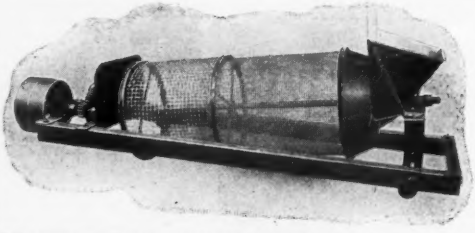

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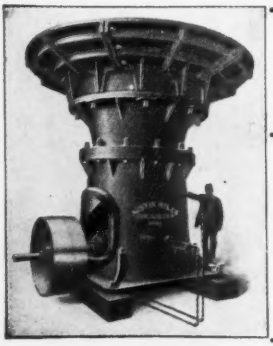
If you have material to screen, it will pay you to learn more about S. & S. Screens, write, giving us an idea of your requirements and we will do the rest.

CEMENT TILE MACHINERY CO. - - 250 Rath St., Waterloo, Iowa



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Jaw and Gyratory Types

The Austin Jaw Crusher produces maximum amount of stone with minimum amount of power and is built for severe service over long periods of operation.

Austin Gyratory Crushers are equipped with every exclusive feature which means maximum output in production and minimum expense for maintenance. Made in nine sizes, 50 to 5,000 tons per day. portable and stationary types.

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Locomotive Cranes—

Second Hand
Rebuilt
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Perforated Metal Screens
FOR STONE, SAND, GRAVEL, ETC.

Plates flat; rolled to diameter or radius for revolving and conical screens butted or lap joints

Elevator Buckets
in all styles and sizes

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There is no branch of the sand, gravel and crushed stone industry for which we cannot furnish the highest quality of perforated metals and screens at rock bottom cost and immediate deliveries.

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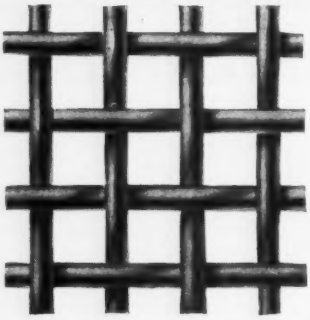

2½ Mesh; 105 Wire

CLEVELAND
DOUBLE-CRIMPED
WIRE CLOTH

Renowned for its Uniformity, its Superior weave, its Durability.
Especially adapted for SAND and GRAVEL Screens.
A large stock of the various meshes always on hand.

Prices right—Catalog on request

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Bucyrus class 14 dragline.
Lidgerwood dragline, 60 ft. boom.
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No. 1 Thew Shovel, 1 yd. dipper.
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20—12 yd. dump cars.
30— 4 " " "
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2—10x16 Vulcan dinkeys, 36 in. gauge.

DONAHUE & CO.
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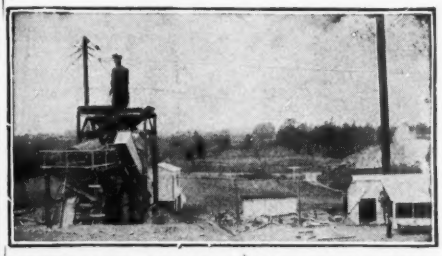
Sell Your Used Equipment by advertising it in

Pit and Quarry



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of Sand and Gravel

is best accomplished with

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Not least among the advantages of this outfit, is its adaptability to almost any conditions. Six years of successful operation have established it as a machine of high economy in underwater or dry sand and gravel operations, because (1) it does away with expensive elevating mechanism, cars, etc; (2) much of its power is that of gravity; (3) its digging, lifting and dumping is one continuous operation; (4) its construction is mechanically correct and enduringly sturdy. Upon your request, we will demonstrate to you its many advantages and show you how best to adapt it to conditions in your pit.

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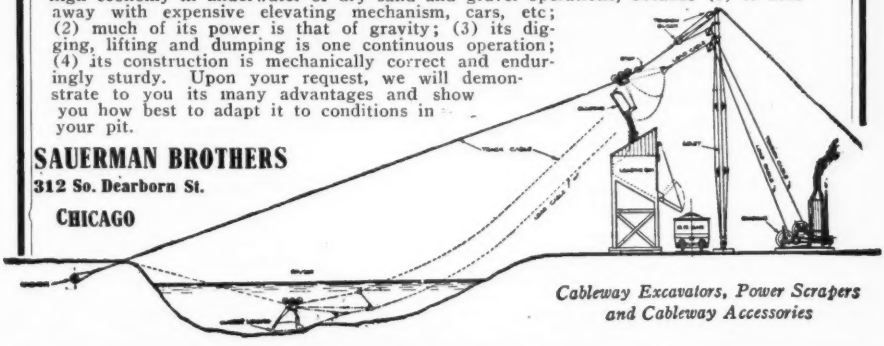
312 So. Dearborn St.
CHICAGO



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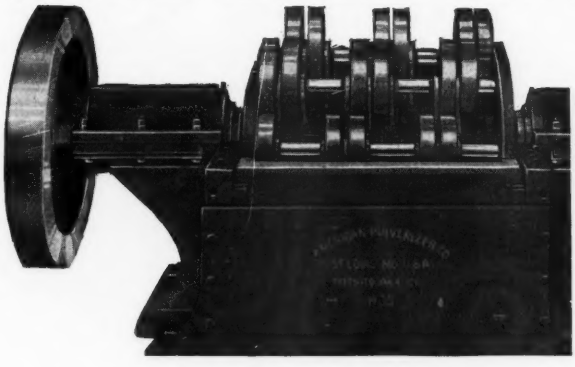
TWICE THE POWER TRANSMITTED BY THE BELT!

Built Stronger, Lasts Longer



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All crushing and grinding parts are of Manganese Steel. Chilled iron liners 1¾ inches thick. Shafts, 5 inches diameter. Discs removed from grinding room of machine. SPEED, 600 R. P. M. Two years' operation without one penny for repairs is one company's record.

For Pulverizing Sandstone, Gypsum, Shale, Slate, Slag, Glass Cullet, Terra Cotta, Phosphate Rock, Limestone, etc. Made in six sizes. *Write for catalog and estimates.*

AMERICAN PULVERIZER CO., East St. Louis, Ill.

A Splendid Opportunity

Offers itself within these covers to men who seek business of sand, gravel and crushed stone men. In reality this specialized magazine is plowing virgin soil. The field offers big business. Have you goods to sell? Then let our Service Department supply you with important trade facts and co-operate to make your campaign a big success.

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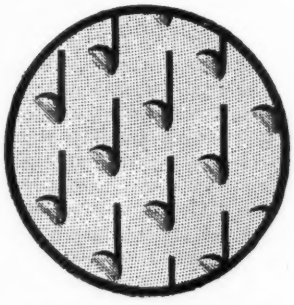
Use No Power Save Your Money

with the

SELLAR GRAVEL WASHER

WASHED AND SCOURED



The Johnson Non-Clogging Screen

The Sellar Gravel Washer requires no power. Gravity runs it, and therefore the cost of operation is no more than that of supplying the washer with water and gravel. The initial outlay is small.

EFFICIENT The Sellar Gravel Washer is simply a flume with a metal false bottom with Johnson Non-Clogging Perforations and a solid metal bottom that carries the sand and silt. It is set at a slant of 1 inch fall per foot. The gravel is let in at the high end and washed down through the flume with water. The sand falls through the perforations; the gravel remains in the upper section. In rolling through the flume and passing through the water, the gravel is perfectly scoured and washed.

PORTABLE The Sellar Gravel Washer is a model of portability. It is made in 8-foot sections, and operates efficiently in 16, 24, 32 ft. combinations, etc. It's just the thing for washing on the job; saving the difference in price between washed and unwashed gravel. Though very strong, it is not heavy.

BIG CAPACITY With a standard screen and a water supply of 400 gallons per minute the Sellar will wash 150 tons a day.

DURABLE The Sellar Gravel Washer is all steel. It has no moving parts to wear out and cause trouble. In short, it is the greatest little gravel washer ever produced.

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SELLAR SUPPLY COMPANY

Everything for Pit and Quarry Operators

557-559 West Quincy Street CHICAGO, ILL.

GREAT QUARRY EQUIPMENT SALE

All Kinds of Quarry Machinery of Recent Make and in Good Condition. Channeling Machines, Rock and Plug Drills, Quarry Bars, Air Compressors and Receivers, Surfacing Machines and Drill Sharpeners. Derricks and Hoisting Engines, Boilers, Engines and Pumps, Stone Crushing Plants.

We have prepared an eight (8) page list of the above equipment. There are over 1,200 big bargains. If you contemplate buying any machinery at this time, you may secure prompt delivery and a material saving in cost by sending for the list.

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CONTRACTORS— ENGINEERS
Continuing the Business Formerly Carried On By
H. S. KERBAUGH, Inc.
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Sullivan VW-61 Duplex Channeler, new 1915.
Ingersoll-Monitor H-8 Channeler, new 1915.
78 ft 10T Steel Tower Booms.
No. 4D Gates Crusher, manganese fitted, new.
No. 7½ Kennedy Crusher, good condition, cheap.
Sullivan Rock Drills, new and used.
12x10 Ingersoll Belt Drive Compressor.
4T Whitcomb Gasoline Locomotive, 36" ga.
22 H. P., D. C., D. D. Hoist.
8½x10, 3 Drum Lambert Hoist.
1½ yd. Jeffrey Grab Bucket, Type B.
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1 ¾-yard Hayward clam-shell.
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1 1-yard Orange-Peel bucket.
1 1-yard Page drag-line Bucket.
1 2-yard Page drag-line Bucket.
1 1-yard slack-line outfit complete.

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1 Ingersoll-Rand Imperial type X-B-2, cap 2,400 ft., belt-driven.
1 14x12 Laidlaw-Dunn-Gordon belt-driven machine.
1 Sullivan 2-stage steam-driven, cap. 550 ft.
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1 15-ton 4-wheel Browning, 40 ft. boom, 1½-yard bucket.
1 15-ton 8-wheel Browning, 45 ft. boom, 1½-yard bucket.
2 15-ton McMyler Whirlies, 14 ft. gauge, 45 ft. boom.

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1 Page drag-line, 50 ft. boom, 1-yard bucket.

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20 4-yard Western 36 in. gauge cars.
22 1½-yard Western 24 in. gauge cars.
20 12-yard Western standard-gauge cars.
30 2½-yard 36 in. gauge quarry cars.
30 60,000 lbs. capacity, gondolas.

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1 10x12 3 Drum with boiler.

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1 No. 1 Thew Traction Shovel, 1-¼-yard, first-class.
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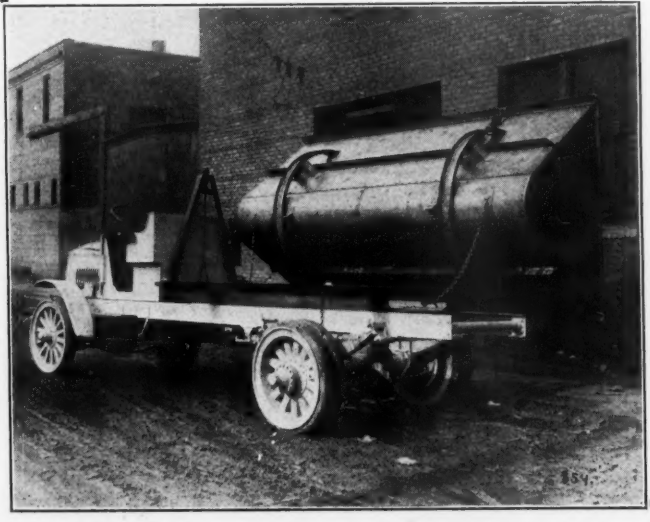

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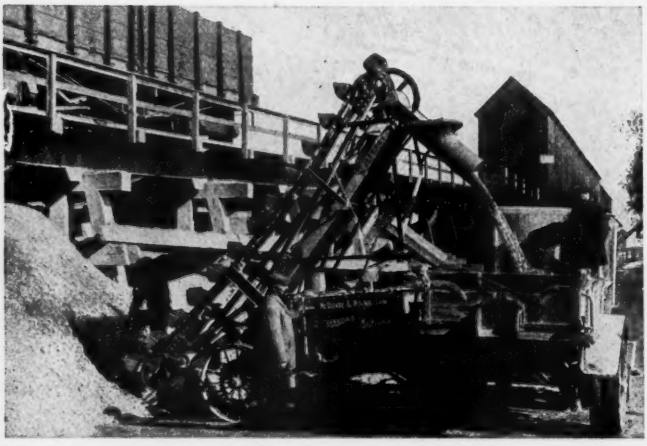

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